



2019 Annual Report



Western Yellowhead Air Management Zone

Prepared by:
Wood
Environment & Infrastructure Solutions
5681 - 70 Street
Edmonton, Alberta
T6B 3P6

For more information, please contact:
Terry Gibson
Executive Director
Western Yellowhead Air Management Zone
Phone: (306) 491-9198
E-mail: wyamz@sasktel.net

TABLE OF CONTENTS

	Page
List of Tables.....	2
List of Figures	3
List of Appendices.....	4
List of Terms and Definitions.....	5
Units of Measurement.....	5
MESSAGE FROM THE EXECUTIVE DIRECTOR.....	6
EXECUTIVE SUMMARY	8
1.0 INTRODUCTION.....	10
1.1 WYAMZ MISSION.....	11
1.2 WYAMZ AIR MONITORING NETWORK.....	11
2.0 AIR QUALITY MONITORING.....	15
2.1 SUMMARY OF EXCEEDANCES ABOVE THE SAAQS	15
2.2 WIND.....	16
2.3 CONTINUOUS AIR QUALITY DATA	18
2.3.1 Sulphur Dioxide (SO_2).....	18
2.3.2 Hydrogen Sulphide (H_2S).....	21
2.3.3 Nitrogen Dioxide (NO_2).....	24
2.3.4 Ozone (O_3).....	28
2.3.5 Fine Particulate Matter ($PM_{2.5}$).....	32
2.4 AIR QUALITY HEALTH INDEX (AQHI).....	37
2.5 AIR QUALITY INDEX (AQI).....	39

TABLE OF CONTENTS

LIST OF TABLES

	Page
Table 1. Annual average concentrations for continuous parameters for 2019.....	9
Table 2. WYAMZ ambient air continuous monitoring stations and the measurement parameters.....	14
Table 3. Number of exceedance events for 2019.....	15
Table 4. Summary statistics for SO ₂ measurement results for 2019	19
Table 5. Number of exceedance events for SO ₂ for 2019	19
Table 6. Summary statistics for H ₂ S measurement results for 2019	22
Table 7. Number of exceedance events for H ₂ S for 2019.....	22
Table 8. Summary statistics for NO ₂ measurement results for 2019	25
Table 9. Number of exceedance events for NO ₂ for 2019.....	25
Table 10. Summary statistics for O ₃ measurement results for 2019	29
Table 11. Number of exceedance events for O ₃ for 2019.....	29
Table 12. Summary statistics for PM _{2.5} measurement results for 2019.....	33
Table 13. Number of exceedance events for PM _{2.5} for 2019.....	33
Table 14. Summary of occurrence statistics for AQHI rating	38
Table 15. AQI rating and effect description	39
Table 16. Summary of occurrence statistics for AQI rating	39

TABLE OF CONTENTS

LIST OF FIGURES

	Page
Figure 1. The Western Yellowhead Air Management Zone (WYAMZ)	12
Figure 2. Locations of the continuous air monitoring stations in the WYAMZ region	13
Figure 3. Wind roses for 1-hour average wind data for 2019.....	17
Figure 4. Pollutant rose for 1-hour average SO ₂ data at the Maidstone station.....	20
Figure 5. Pollutant rose for 1-hour average SO ₂ data at the Kerrobert station	20
Figure 6. Pollutant rose for 1-hour average H ₂ S data at the Maidstone station.....	23
Figure 7. Pollutant rose for 1-hour average H ₂ S data at the Kerrobert station	23
Figure 8. Pollutant rose for 1-hour average NO ₂ data at the Meadow Lake station.....	26
Figure 9. Pollutant rose for 1-hour average NO ₂ data at the Maidstone station.....	26
Figure 10. Pollutant rose for 1-hour average NO ₂ data at the Clavet station	27
Figure 11. Pollutant rose for 1-hour average NO ₂ data at the Meadow Lake City station	27
Figure 12. Pollutant rose for 1-hour average O ₃ data at the Meadow Lake station	30
Figure 13. Pollutant rose for 1-hour average O ₃ data at the Clavet station	30
Figure 14. Pollutant rose for 1-hour average O ₃ data at the Meadow Lake City station	30
Figure 15. Pollutant rose for 1-hour average PM _{2.5} data at the Meadow Lake Station.....	34
Figure 16. Pollutant rose for 1-hour average PM _{2.5} data at the Maidstone Station.....	34
Figure 17. Pollutant rose for 1-hour average PM _{2.5} data at the Clavet Station.....	35
Figure 18. Pollutant rose for 1-hour average PM _{2.5} data at the Kerrobert Station.....	35
Figure 19. Pollutant rose for 1-hour average PM _{2.5} data at the Meadow Lake City Station.....	36
Figure 20. Health risk classification and health messages for Air Quality Health Index	38

TABLE OF CONTENTS

LIST OF APPENDICES

- APPENDIX A. Saskatchewan Ambient Air Quality Standards
- APPENDIX B. Meadow Lake Station: Continuous Monitoring Data
- APPENDIX C. Maidstone Station: Continuous Monitoring Data
- APPENDIX D. Clavet Station: Continuous Monitoring Data
- APPENDIX E. Kerrobert Station: Continuous Monitoring Data
- APPENDIX F. Meadow Lake City Station: Continuous Monitoring Data
- APPENDIX G. WYAMZ Exceedance Summary
- APPENDIX H. 2019 Financial Statements
- APPENDIX I. WYAMZ Board of Directors
- APPENDIX J. WYAMZ Member Companies

List of Terms and Definitions

24-hour	A calendar day, average is calculated midnight-to-midnight.
8-hour	8-hour running average for O ₃ Canada-Wide Standards.
SAAQS	Saskatchewan Ambient Air Quality Standard
AIC	Automatic Instrument Check (instrument self-verification process)
AMG	Air Monitoring Guidelines for Saskatchewan, March 2012
Calm	1-hour average wind speed lower than 1 km/hour
CWS	Canada-Wide-Standards
ET	Ambient temperature
H ₂ S	Hydrogen sulphide
NO ₂	Nitrogen dioxide
NO	Nitric oxide
NO _x	Oxides of nitrogen
O ₃	Ozone
PM _{2.5}	Particulate matter with aerodynamic diameter less than 2.5 µm, referred to as fine or respirable particles
QA/QC	Quality Assurance / Quality Control
RH	Relative humidity
SO ₂	Sulphur dioxide
WD	Wind direction
WS	Wind speed

Units of Measurement

average	arithmetic average = $\sum Xi / n$
m/s	meter per second, or mps
µg/m ³	microgram per cubic meter
ppb	part per billion by volume
mm	millimeter of precipitation
°C	degree centigrade
%	percent of relative humidity, instrument uptime, etc.
Degree	angle of wind direction from true north

MESSAGE FROM THE EXECUTIVE DIRECTOR

2019 was an excellent year for Western Yellowhead Air Management Zone (WYAMZ) and for air quality monitoring in the western Yellowhead region of Saskatchewan. WYAMZ is very pleased to inform our members that seven (7) continuous air monitoring sites recording criteria air contaminant measurements are now operating in the region and providing real time data. Four of these stations are operated by WYAMZ. We also have the data from the two air monitoring stations operated and independently calibrated by Husky and the data from the National Air Pollution Surveillance Program (NAPS) Station in Saskatoon. We are exploring every opportunity to collaborate with other agencies in bringing additional monitoring into the region.

This monitoring initiative is multi-purpose it: a) collects real time air quality data throughout the WYAMZ region, b) demonstrates companies are operating in a safe, environmentally sound manner that is enabling sustainable growth, and c) provides companies considering to invest in operations in Saskatchewan with data that shows it is a safe place to invest being that the air quality is well understood and not an impediment to growth. The credibility and strength of the continuous monitoring network is scientifically and financially sound. The continuous data is available live on the internet; it includes hourly concentrations of SO₂, H₂S, NO/NO₂/NO_x, PM_{2.5} and O₃ as well as meteorological data at about two metres above the ground. The data is available on the WYAMZ website: <http://www.wyamz.ca>

After reviewing the past three to five years of meteorological and ambient air quality data, the WYAMZ Science Committee has made a decision that some of the existing monitoring stations have provided enough relevant data for those areas and can provide additional useful data if they were relocated in other WYAMZ communities. The Kindersley airpointer was moved to the Town of Kerrobert on November 20, 2017. The Unity airpointer was moved in the fall of 2018 to Clavet, a village about 20 kilometers east of Saskatoon. The Meadow Lake airpointer was moved from the Cabana Pasture into the City of Meadow Lake in the fall of 2019.

After an extensive review of our communication strategy our Communication Committee has worked with YasTech Developments Inc. to redesign our website (wyamz.ca). It has a new look and easy to access Dashboard reports. Also, monthly quality assured data for each station since July of 2015 is available. There is also a search function that allows visitors to access raw data for the past 120 days at any of the airpointers. The new website is connected to Facebook to allow for better communication opportunities for our members and the public. Real-time air monitoring data can be seen at www.wyamz.ca. Real time and long-term historical data that can be used to evaluate future development scenarios can be obtained from WYAMZ by request.

We have and are continuing to communicate the work we do in many ways. When we do a presentation or place an article or a story in a newspaper we highlight our members wherever possible. We list our members on our website and do as much as we can to inform the public the names of our member companies. This communication work is very important to WYAMZ and to its members.

Here are some of our recent and upcoming communication initiatives:

The Lloydminster Heavy Oil Show, September of 2014, 2016 and 2018. This once again provided us with an excellent showcase to inform the public of the work we do and highlight the names of our members and their participation in transparent reporting of air quality. We will maintain our booth at the 2020 Lloydminster Heavy Oil Show.

Saskatchewan Association of Rural Municipalities (SARM) the Councillor Newsletter Article
In 2016 the WYAMZ Communications Committee and Board of Directors worked with a communications consultant to review our communications strategy, review our website and has begun to utilize social media such as Facebook in 2017.

WYAMZ had a booth in April of 2017, 2018 and 2019 at the Saskatchewan Environmental Society's "Living Green Expo" held at Prairie Land Park in Saskatoon. It was an excellent opportunity to showcase the work we do. We will attend again in 2020.

The WYAMZ Board is working with the Science Fairs in our area. We will be providing the winner of the science Fair with the Gerry Mooney Environmental Award to honour our former Board Director Mr. Gerry Mooney. We did present Saabir Yousuf and Kevin Liu the Gerry Mooney Environmental Award at the Saskatoon Regional Science Fair, University of Saskatchewan, April 3, 2019. We are committed to provide this Award and funding every year.

All of these showcase the work we do and our members' involvement. Future plans include determining the need for additional air monitoring stations, development of more communication materials, presentations to municipalities, Chambers of Commerce, high school classes, School Community Council meetings, etc.

WYAMZ is pleased with the excellent response we received from our members. We have had a very good year financially and with our data monitoring capabilities. This is excellent news for the people of the western Yellowhead area of Saskatchewan and for all of our valued members. We now have data to help inform our decision-making process. The Science committee will review all of this data and bring recommendations to the Board as to how we should proceed with managing our monitoring capabilities. The data will direct our decisions as to how to improve our monitoring network.

Our objective is to collaboratively identify local air quality issues, and to develop and operate appropriate monitoring programs. Through diverse stakeholder representation WYAMZ recognizes concerns specific to the region, and encourages solutions that are tailored to address the needs of its members. Our goal is to collect credible and defensible air quality data and provide excellent service to our members. WYAMZ thanks all of our members for their participation.

EXECUTIVE SUMMARY

The Western Yellowhead Air Management Zone (WYAMZ), established in 2012, is the second air management association in Saskatchewan. WYAMZ is a collaborative group of industry, government, non-government organizations, and private citizens. The air management zone covers an area that stretches from east of Saskatoon to the Alberta border, and from north of Meadow Lake to south of Rosetown, as shown in Figure 1 of the main report. Major economic activities in the region include agriculture, oil and gas, mining, power generation, and transportation.

WYAMZ manages a continuous air monitoring network. Figure 2 of the main report illustrates spatial distribution of the air monitoring stations in the WYAMZ region. The continuous air monitoring network consists of four airpointers® at the Meadow Lake/Meadow Lake City, Maidstone, Clavet, and Kerrobert stations. Three additional continuous monitoring stations also operate within the WYAMZ region. A continuous air monitoring NAPS (National Air Pollution Surveillance Program) station is operated by the Ministry of Environment in Saskatoon, and the Husky East and West stations in Lloydminster are owned and operated by Husky Energy.

The WYAMZ network monitors sulphur dioxide (SO₂), hydrogen sulphide (H₂S), nitrogen oxides (NO, NO₂, NO_x), ozone (O₃), fine particulate matter (PM_{2.5}), ambient temperature (ET), relative humidity (RH), precipitation, wind speed (WS) and wind direction (WD). Both the annual and monthly uptime for all analyzers was greater than 90% in 2019.

Table 1 summarizes the annual average concentration data for January to December 2019; the measured air quality was within the Saskatchewan Ambient Air Quality Standards (SAAQS), with the exception of H₂S. There was a total of 3 exceedance events for 1-hour average H₂S. The air quality at the WYAMZ air monitoring stations was rated Low Risk or Good for more than 96% of the time according to the Air Quality Health Index and Air Quality Index.

Table 1 Annual average concentrations for continuous parameters for 2019

Pollutant	Conc. Unit	Annual Average Concentration for Continuous Data				
		Meadow Lake ^b	Meadow Lake City ^c	Clavet	Maidstone	Kerrobert
SO ₂	ppb	<i>a</i>	<i>a</i>	<i>a</i>	0.4	0.2
H ₂ S	ppb	<i>a</i>	<i>a</i>	<i>a</i>	0.3	0.2
NO	ppb	0.2	0.9	2.2	0.8	<i>a</i>
NO ₂	ppb	0.9	3.2	6.2	3.5	<i>a</i>
NO _x	ppb	1.0	4.1	8.4	4.2	<i>a</i>
O ₃	ppb	31	23	26	<i>a</i>	<i>a</i>
PM _{2.5}	µg/m ³	5	6	6	5	5

a. Parameter was not monitored.

b. Station was operational until November 16, 2019

c. Station operational starting November 28, 2019

1.0 Introduction

The Western Yellowhead Air Management Zone (WYAMZ), established in 2012, is the second air management association in Saskatchewan. WYAMZ is a collaborative group of industry, government, non-government organizations, and private citizens. The WYAMZ design is in-line with the directive from the Canadian Council of Ministers of the Environment under the Canada-wide Air Quality Management System. The association is designed to collect credible, continuous real-time air quality information through collaborative efforts.

Figure 1 illustrates the WYAMZ zone which covers the west central region of the province. The air management zone encompasses an area from east of Saskatoon to the Alberta border, and from north of Meadow Lake to south of Rosetown. Major economic activities in the region include agriculture, oil and gas, mining, power generation, and transportation.

Membership in the WYAMZ is currently voluntary. The current membership includes members of the agriculture, chemistry, oil and gas, mining and power generation sectors, as well as the public. The Government of Saskatchewan Ministry of Environment, Ministry of Economy, as well as representatives of the City of Saskatoon, University of Saskatchewan, Prairie North Regional Health Authority and the Saskatchewan Environmental Society also participate as members of the Board of Directors. WYAMZ's budget consists of membership fees, environmental footprint, and emissions-based fees assessed to facilities operating within the air management zone.

1.1 WYAMZ Mission

The WYAMZ mission is to collect credible, scientifically defensible air quality data for west central Saskatchewan, and to make this data freely available to all stakeholders. The objective is to bring together stakeholders from all backgrounds to identify local air quality issues and to develop innovative solutions for managing these issues

1.2 WYAMZ Air Monitoring Network

Figure 2 illustrates a map of the air monitoring stations in the WYAMZ region. Real-time data for these stations is available through the WYAMZ website or the Saskatchewan Ministry of Environment. There are seven continuous air monitoring stations in the region. The Meadow Lake/Meadow Lake City, Maidstone, Clavet and Kerrobert stations are owned and operated by WYAMZ; the Saskatoon station is owned and operated by the Ministry of Environment. The Husky East and West stations in Lloydminster are owned and operated by Husky Energy.

WYAMZ operates four airpointers® at the Meadow Lake/Meadow Lake City, Maidstone, Clavet and Kerrobert stations. The network measures continuous data for sulphur dioxide (SO₂), hydrogen sulphide (H₂S), nitrogen oxides (NO, NO₂, NO_x), ozone (O₃), fine particulate matter (PM_{2.5}), ambient temperature (ET), relative humidity (RH), precipitation, wind speed (WS) and wind direction (WD). Table 2 presents a combination matrix of the monitoring stations and the measured parameters. The airpointers® have been operating since December 1, 2013. Publicly available real-time air monitoring data is available on the WYAMZ website at: www.wyamz.ca.

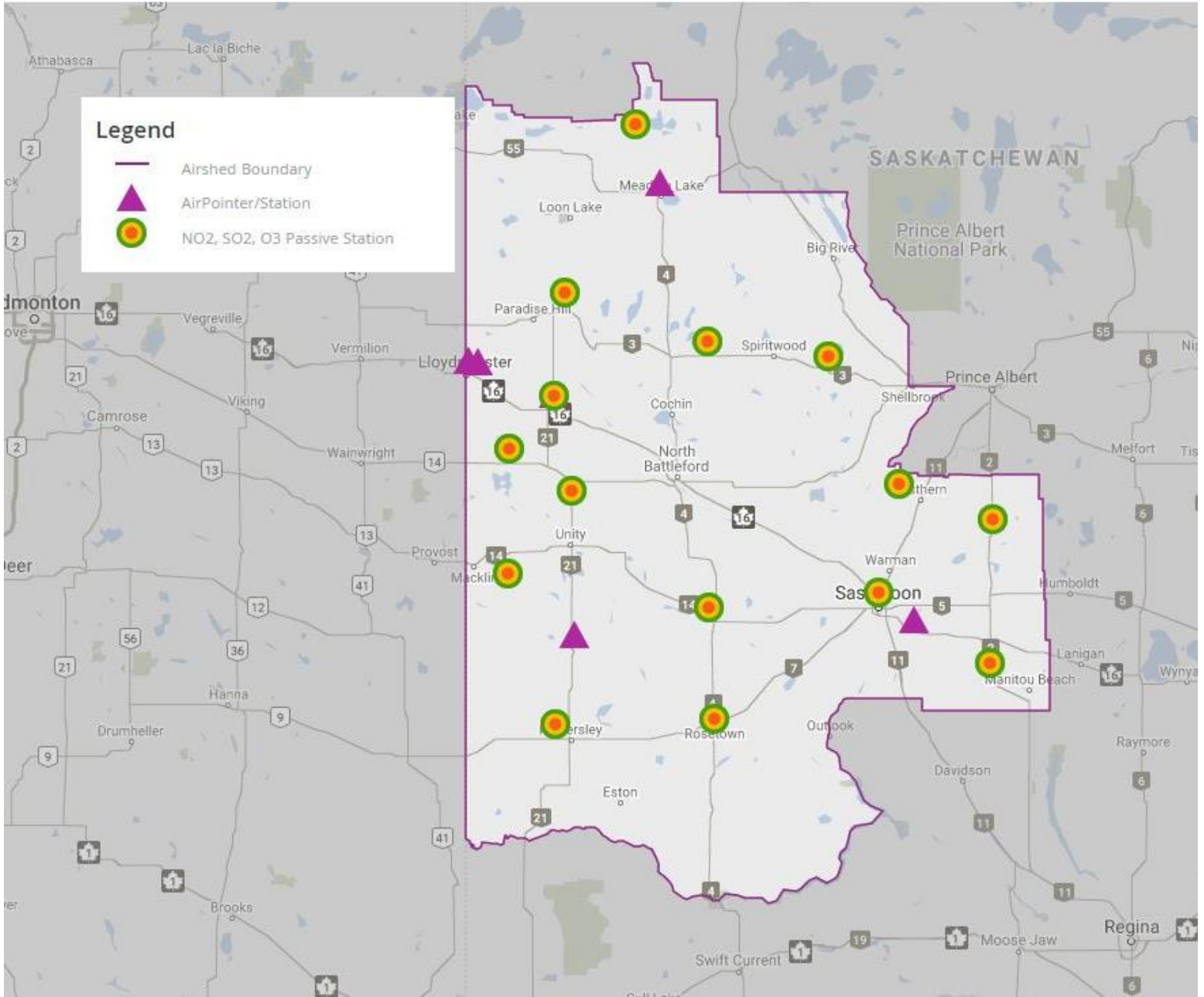


Figure 1. The Western Yellowhead Air Management Zone (WYAMZ)

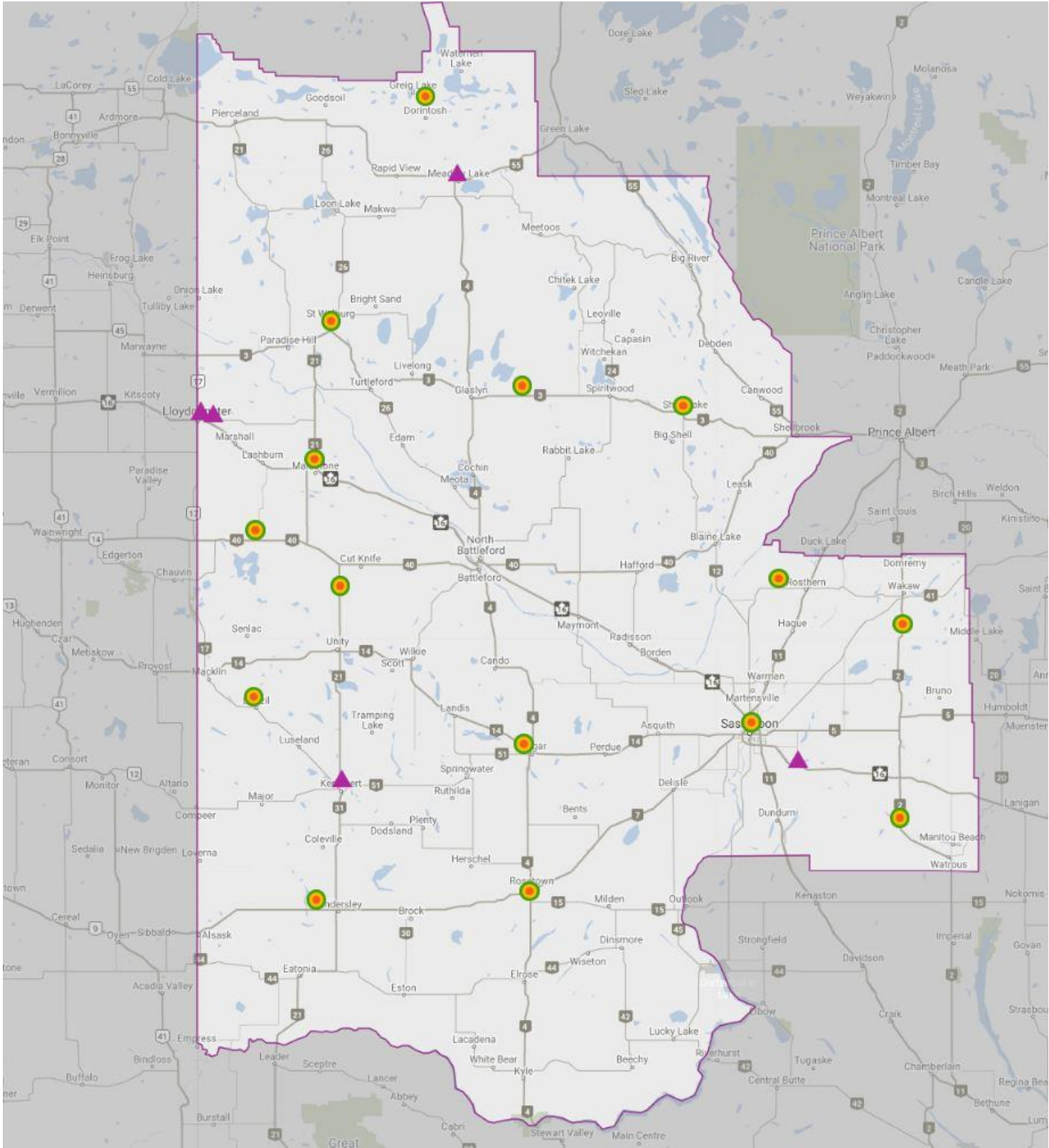


Figure 2. Locations of the continuous air monitoring stations in the WYAMZ zone

Table 2. WYAMZ ambient air continuous monitoring stations and the measurement parameters

Monitoring Parameters	Continuous air quality parameters measured in the WYAMZ network			
	Meadow Lake/ Meadow Lake City	Maidstone	Clavet	Kerrobert
SO ₂	<i>a</i>	✓	<i>a</i>	✓
H ₂ S	<i>a</i>	✓	<i>a</i>	✓
NO	✓	✓	✓	<i>a</i>
NO ₂	✓	✓	✓	<i>a</i>
NO _x	✓	✓	✓	<i>a</i>
O ₃	✓	<i>a</i>	✓	<i>a</i>
PM _{2.5}	✓	✓	✓	✓
Precipitation	✓	✓	✓	✓
Ambient Temperature	✓	✓	✓	✓
Relative Humidity	✓	✓	✓	✓
Wind Speed	✓	✓	✓	✓
Wind Direction	✓	✓	✓	✓

a. Parameter was not monitored.

2.0 Air Quality Monitoring

2.1 Summary of Exceedances above the SAAQS

The WYAMZ ambient air monitoring network measures air pollutant concentrations to indicate the general quality of air in the management zone. Comparing measured air quality data with the Saskatchewan Ambient Air Quality Standards and Federal guidelines ensures public and environmental health is not impaired. Air quality data is used to evaluate the trends in air quality resulting from emissions of anthropogenic sources (industry, motor vehicles, etc) and natural processes (such as forest fires, decomposition of organic matter, etc).

Table 3 summarizes the Saskatchewan Ambient Air Quality Standards (SAAQS) and the number of exceedances recorded in 2019. A total of 3 exceedance events for 1-hour average H₂S, were recorded for the WYAMZ air monitoring network. There were 58 8-hour running averages greater than the O₃ Canada-Wide Standard (CWS) of 65 ppb.

Table 3. Number of exceedance events for 2019

Parameter	No. of Stations	Average Type	SAAQS	No. of Exceedance
SO ₂	2	1-hour	172 ppb	0
		24-hour	48 ppb	0
		Annual	8 ppb	0
H ₂ S	2	1-hour	11 ppb	3
		24-hour	3.6 ppb	0
NO ₂	3	1-hour	159 ppb	0
		Annual	24 ppb	0
O ₃	2	1-hour	82 ppb	0
		8-hour	63 ppb CWS ^a	0
PM _{2.5}	4	24-hour	28 µg/m ³	0

a. The 3-year average of the annual 4th-highest daily maximum 8-hour average concentrations

2.2 Wind

Wind speed and wind direction, as well as other meteorological parameters, are important factors that influence regional air quality. The diffusion and dispersion of air pollutant emissions are greatly impacted by variations in wind speed and corresponding air turbulence. Different degrees of turbulence are created by variable mixing conditions due to the vertical gradient of ambient temperatures and terrain roughness unique to each station.

Figure 3 presents the wind roses at the WYAMZ continuous monitoring stations. Generally, the prevailing wind speed was calm most of time. According to the international wind classification system, prevailing wind primarily consisted of Light Air (0.3 m/s – 1.4 m/s) and Light Breeze (1.4 m/s – 3.1 m/s), Moderate Breeze (3.1 m/s – 7.8 m/s) and fast wind (>7.8 m/s). All stations wind speed ranges were Light Air, Light Breeze or Moderate Breeze most of the time.

The prevailing wind direction was not consistent among the four air monitoring stations. The Meadow Lake station was characterized with winds from the west and southeast quadrant. The Clavet station winds were primarily from the southwest and east. The Maidstone station was characterized with a prevalent wind from the northwest and southeast quadrant. Prevalent winds from the northwest was seen at the Kerrobert station.

The detailed frequency distribution table and wind rose are presented in the Appendices: Table B-10, Table C-11, Table D-10, and Table E-8.

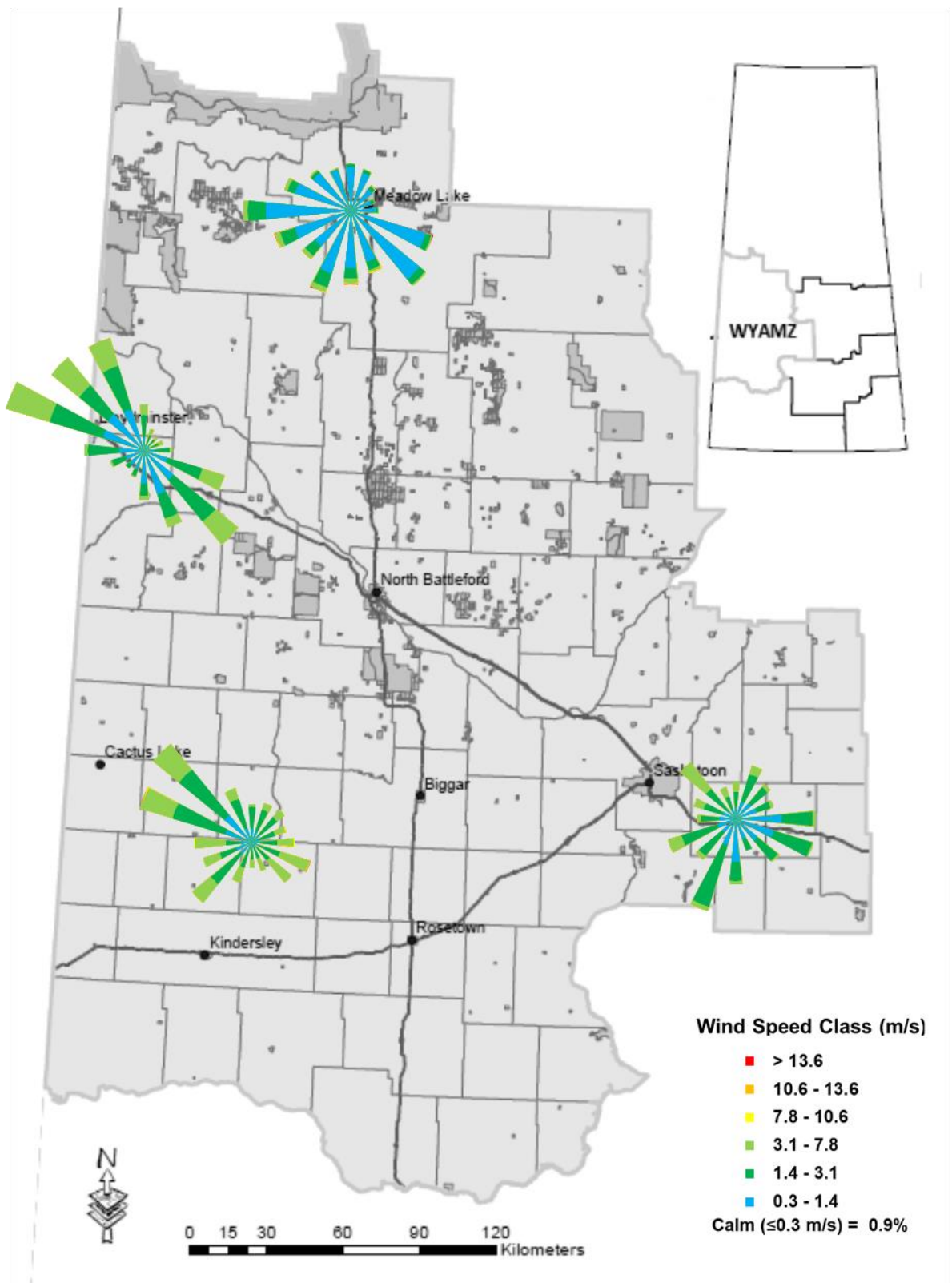


Figure 3. Wind roses for 1-hour average wind data for 2019

2.3 Continuous Air Quality Data

2.3.1 Sulphur Dioxide (SO₂)

Sulphur dioxide (SO₂) is a colourless gas with a strong suffocating odour. It smells like burnt matches. At concentrations above 300 ppb, it can be detected by taste and odour. The health effects caused by exposure to high levels of SO₂ include breathing problems, respiratory illness, changes in lung function, and worsening respiratory and cardiovascular disease. People with asthma or chronic lung or heart disease are the most susceptible to SO₂. SO₂ also damages trees and crops.

SO₂, along with nitrogen oxides, are the main precursors of photochemical smog and acid rain, which contributes to the acidification of lakes and streams, accelerated corrosion of buildings, and reduced visibility. SO₂ in the air can form microscopic acid aerosols, which have serious health implications, as well as, contributing to climate change.

Anthropogenic SO₂ emission sources are primarily from combustion of sulphur containing fuels (e.g. gasoline, natural gas and coal) and processing of sulphur containing ores. The major emission sources for SO₂ include large industrial sources such as power plants, petroleum refineries, iron and steel mills, fertilizer plants, pulp and paper mills, and smelters, as well as small industries, such as small oil and gas plants, battery and well flares.

The Saskatchewan Ambient Air Quality Standards (SAAQS) for sulphur dioxide are:

- 1-hour average SAAQS = 172 ppb
- 24-hour average SAAQS = 48 ppb
- annual average SAAQS = 8 ppb

Table 4 presents the summary statistics for SO₂ measurement results. The measured concentration was low at both stations. The concentration from 2019 was 0.4 ppb and 0.2 ppb at the Maidstone and Kerrobert stations, respectively. The maximum 1-hour average concentration of 17.8 ppb and the maximum 24-hour average concentration of 3.6 ppb were detected at the Maidstone station. There was no exceedance of the SAAQS for 1-hour, 24-hour, and annual average concentrations (see Table 5).

Figures 4 and 5 present the pollutant roses for 1-hour average concentration for SO₂. For more than 95% of the time, SO₂ concentration was less than or equal to 1 ppb (blue petals); the concentration seldom exceeded 5 ppb (green petals). The higher concentration events (>1 ppb) tend to be detected more frequently when wind was from the southeast quadrant for Maidstone.

The detailed frequency distribution tables for the pollutant roses are presented in the Appendices: Table C-2 and Table E-2.

Table 4. Summary statistics for SO₂ measurement results for 2019

Monitoring Station	Annual Average	Instrument Uptime	Maximum SO ₂ Conc. and Occurrence Time			
			1-hour Max.		24-hour Max.	
	ppb	%	ppb	Time	ppb	Date
Maidstone	0.4	99.0%	17.8	Dec-30 15:00	3.6	Jan-30
Kerrobert	0.2	98.2%	3.6	Feb-16 06:00	2.5	Feb-12

Table 5. Number of exceedance events for SO₂ for 2019

Monitoring Station	No. of Exceedance of Saskatchewan SO ₂ Ambient Air Quality Standard (SAAQS)		
	1-hr SAAQS	24-hr SAAQS	Annual SAAQS
	172 ppb	48 ppb	8 ppb
Maidstone	0	0	0
Kerrobert	0	0	0

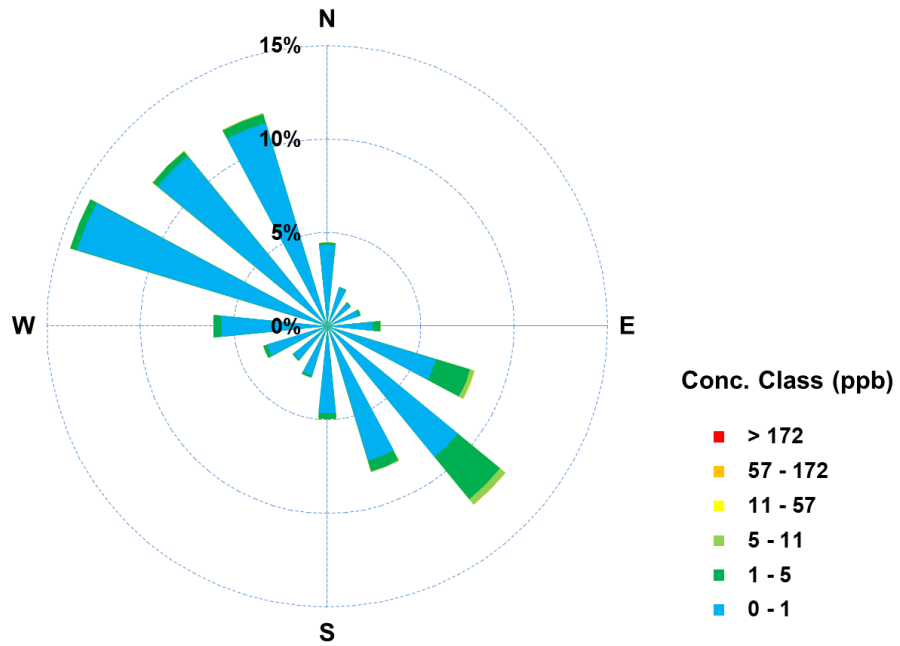


Figure 4. Pollutant rose for 1-hour average SO₂ data at the Maidstone station

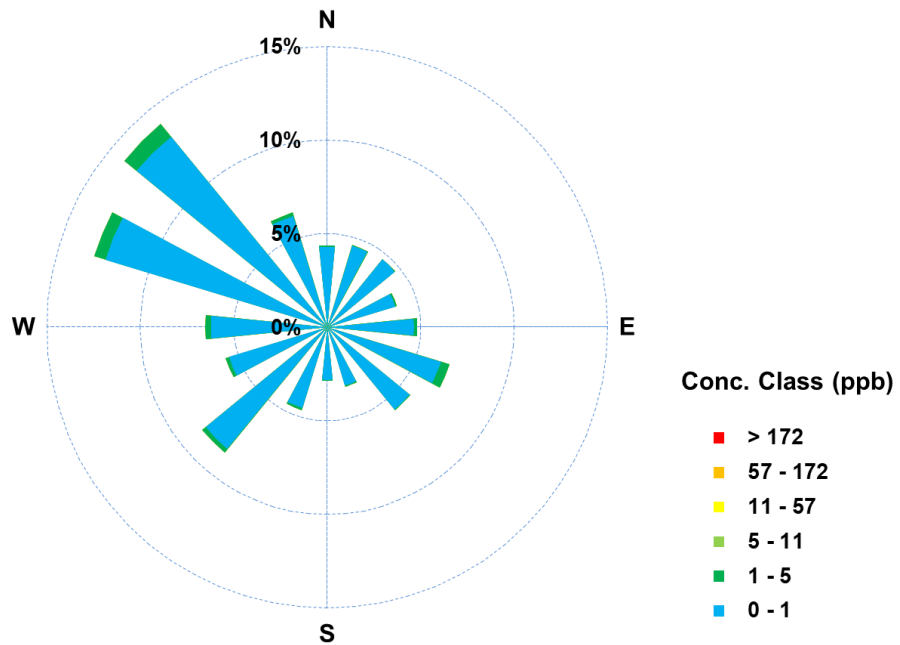


Figure 5. Pollutant rose for 1-hour average SO₂ data at the Kerrobert station

2.3.2 Hydrogen Sulphide (H₂S)

Hydrogen sulphide (H₂S) is a colourless gas with a characteristic “rotten egg” odour. It is produced both naturally and through anthropogenic emission sources. H₂S occurs naturally in coal, crude oil, natural gas, oil, sulphur hot springs, volcanic gases, sloughs, swamps and lakes. The major anthropogenic emission sources include natural gas and petroleum production, wastewater treatment, pulp and paper mills, rayon textile manufacturing, and tar and asphalt manufacturing. Decomposition of organic matter by bacteria under anaerobic conditions releases H₂S as well, forming the characteristic odour commonly associated with sewers, sewage lagoons, and swamps.

Hydrogen sulfide is a highly toxic and flammable gas. It is heavier than air and tends to accumulate at the bottom of poorly ventilated spaces. Although very pungent at first, it quickly deadens the sense of smell. Potential victims may be unaware of its presence until it is too late.

The Saskatchewan Ambient Air Quality Standards (SAAQS) for hydrogen sulphide are:

- 1-hour average SAAQS = 11 ppb
- 24-hour average SAAQS = 3.6 ppb

Table 6 presents the summary statistics for H₂S measurement results. The measured concentration was low at both stations; the average concentration from 2019 were 0.2 ppb and 0.2 ppb at the Maidstone and Kerrobert stations, respectively. The maximum 1-hour average concentration of 13.3 ppb and the maximum 24-hour average concentration of 2.1 ppb were both measured at the Maidstone station. There were three exceedances of the SAAQS for 1-hour average concentration at the Maidstone station (see Table 7).

Figures 6 and 7 present the pollutant roses for 1-hour average H₂S. For more than 99% of time, H₂S concentration was less than or equal to 1 ppb (blue petals) at both stations. The higher concentrations (>1 ppb) at the Maidstone station tend to be slightly more frequent when wind was from the northwest and southeast directions. The higher concentration events at the Kerrobert station tend to be slightly more frequent when wind was from the northwest quadrant, however the sample size was small.

The detailed frequency distribution tables for the pollutant roses are presented in the Appendices: Table C-3 and Table E-3.

Table 6. Summary statistics for H₂S measurement results for 2019

Monitoring Station	Annual Average	Instrument Uptime	Maximum H ₂ S Conc. and Occurrence Time			
			1-hour Max.		24-hour Max.	
	ppb	%	ppb	Time	ppb	Date
Maidstone	0.3	99.0%	13.3	Aug 08 05:00	2.1	Jun-13
Kerrobert	0.2	98.2%	6.4	Sep 05 03:00	1.1	Aug-6

Table 7. Number of exceedance events for H₂S for 2019

Monitoring Station	No. of Exceedances of Saskatchewan H ₂ S Ambient Air Quality Standard (SAAQS)	
	1-hr SAAQS	24-hr SAAQS
	11 ppb	3.6 ppb
Maidstone	3	0
Kerrobert	0	0

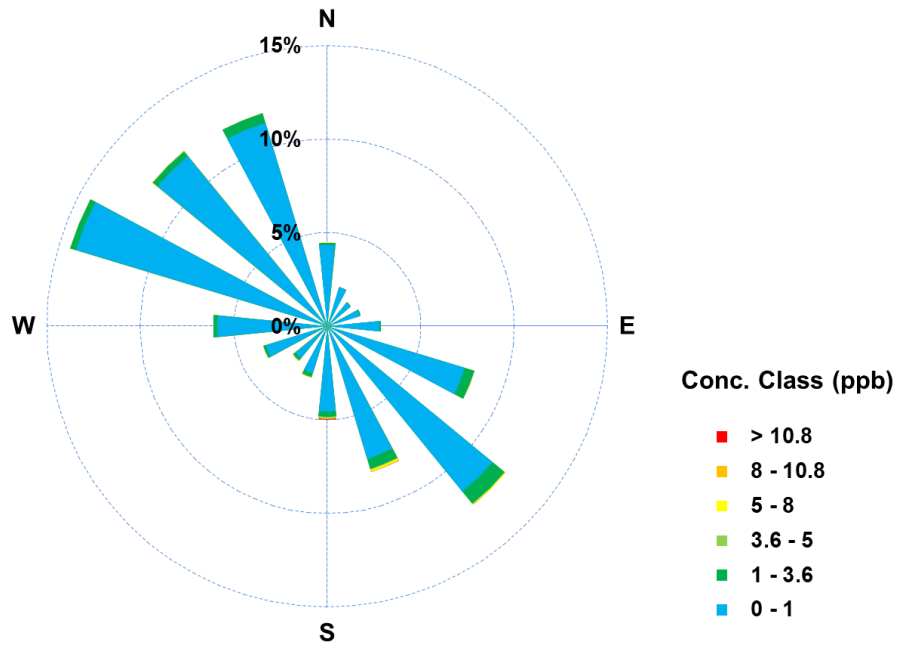


Figure 6. Pollutant rose for 1-hour average H₂S data at the Maidstone station

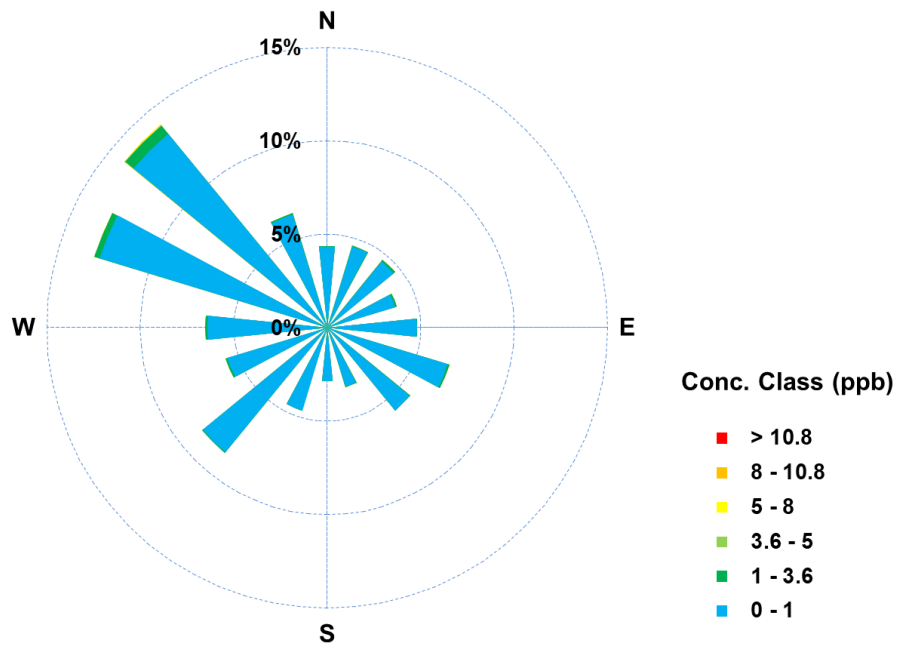


Figure 7. Pollutant rose for 1-hour average H₂S data at the Kerrobert station

2.3.3 Nitrogen Dioxide (NO₂)

Nitrogen oxides, also known as oxides of nitrogen (NO_x), is a collective term for nitric oxide (NO) and nitrogen dioxide (NO₂). Nitric oxide is a colorless, flammable gas with a slight odour. Nitrogen dioxide is a reddish brown, non-flammable gas with a pungent irritating odour. NO₂ is of more interest than NO from both a health and acid rain perspective.

NO_x can cause respiratory disease, damage vegetation, and reduce visibility. The primary concern with NO_x emissions is their contribution to formation of ground-level ozone, smog and acid rain. To a lesser extent, some NO_x compounds (e.g. N₂O) contribute to stratospheric ozone layer depletion and global warming.

NO_x emissions are mainly produced by fossil fuel combustion. High temperature conditions during combustion result in the formation of NO_x as a by-product. The major anthropogenic emission sources for NO_x are associated with fuel combustion, including both stationary sources, such as power plants, oil and gas industries, incinerators, as well as mobile sources such as automobiles. Non-combustion sources, for example nitric acid manufacture, welding processes and the use of explosives, comprise the smaller emission sources. In large cities, motor vehicle emissions are the major source of NO_x, as well as space heating emissions in the winter.

The Saskatchewan Ministry of Environment regulates ambient air concentration for nitrogen dioxide. The Saskatchewan Ambient Air Quality Standards (SAAQS) for nitrogen dioxide are:

- 1-hour average SAAQS = 159 ppb
- annual average SAAQS = 24 ppb

Table 8 presents the summary statistics for NO₂ measurement results. The Clavet station measured a higher concentration than the other two stations, with an annual average of 6.2 ppb. The average concentration recorded at the Meadow Lake station was 0.9 ppb and 0.4 ppb at Meadow Lake City station. The average concentration recorded at the Maidstone station was 3.5 ppb. Both the maximum 1-hour concentration station and maximum 24-hour concentration was detected at the Clavet station. There was no exceedance of the 1-hour or annual SAAQS (see Table 9).

Figures 8 to 11 present the pollutant roses for 1-hour average concentrations for NO₂. The concentration at the Meadow Lake station was the lowest among the three stations; for more than 98% of the time NO₂ concentration was less than 5 ppb. The >5 ppb events tend to be slightly more frequent when wind was from the west and southeast quadrants, however the sample size was too small to conclude the trend. At the Clavet station, 21.8% of the time NO₂ concentration was higher than 5 ppb. The >5 ppb events tend to be more frequent when wind was from the southwest and east directions, however the sample size was too small to conclude the trend. The concentration at the Maidstone station tends to be the highest among the three stations; 22.3% of the time NO₂ concentration was greater than 5 ppb; these events tend to be more frequent when wind was from the northwest and southeast quadrants. In addition to the

directional trends, a seasonal trend was observed at all stations; NO₂ concentration tends to be higher during the winter months.

The detailed frequency distribution tables for the NO, NO₂ and NO_x pollutant roses are presented in the Appendices: Tables B-2 to B-4, Tables C-4 to C-6, and Tables D-2 to D-4.

Table 8. Summary statistics for NO₂ measurement results for 2019

Monitoring Station	Annual Average	Instrument Uptime	Maximum NO ₂ Conc. and Occurrence Time			
			1-hour Max.		24-hour Max.	
			ppb	%	ppb	Time
Meadow Lake ^a	0.9	93.0%	29.6	Feb 05 22:00	4.8	Feb-19
Maidstone	3.5	99.0%	27.2	Jan-13 19:00	22.9	Jan-13
Clavet	6.2	100.0%	43.6	Feb 06 18:00	27.2	Feb-06
Meadow Lake City ^b	0.4	100.0%	35.1	Dec 13 08:00	12.3	Dec-27

a. Parameter was monitored until November 16.

b. Parameter was operational starting November 28.

Table 9. Number of exceedance events for NO₂ for 2019

Monitoring Station	No. of Exceedances to Saskatchewan NO ₂ Ambient Air Quality Standard (SAAQS)	
	1-hr SAAQS	Annual SAAQS
	159 ppb	24 ppb
Meadow Lake ^a	0	0
Maidstone	0	0
Clavet	0	0
Meadow Lake City ^b	0	0

a. Parameter was monitored until November 16.

b. Parameter was operational starting November 28.

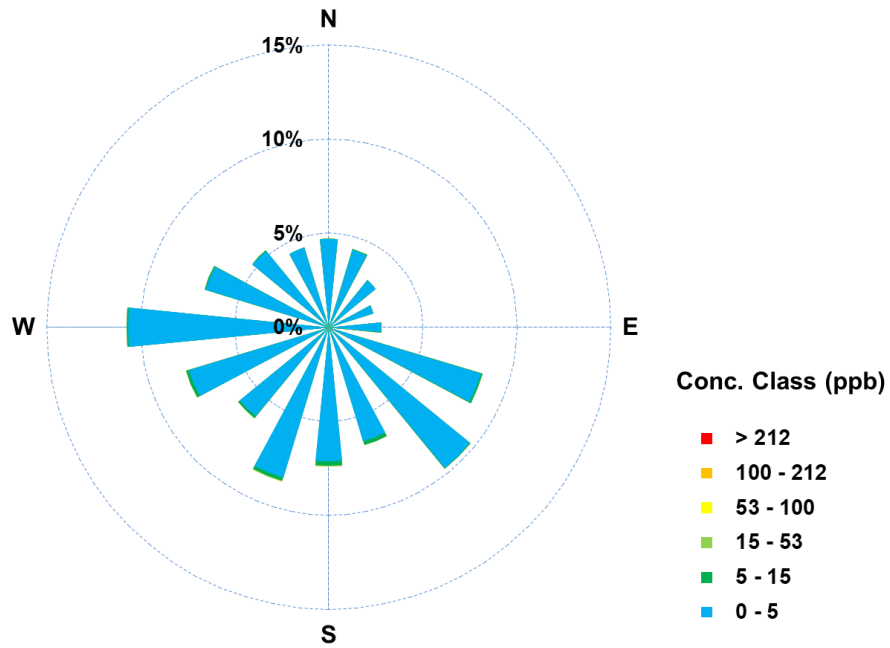


Figure 8. Pollutant rose for 1-hour average NO₂ data at the Meadow Lake station

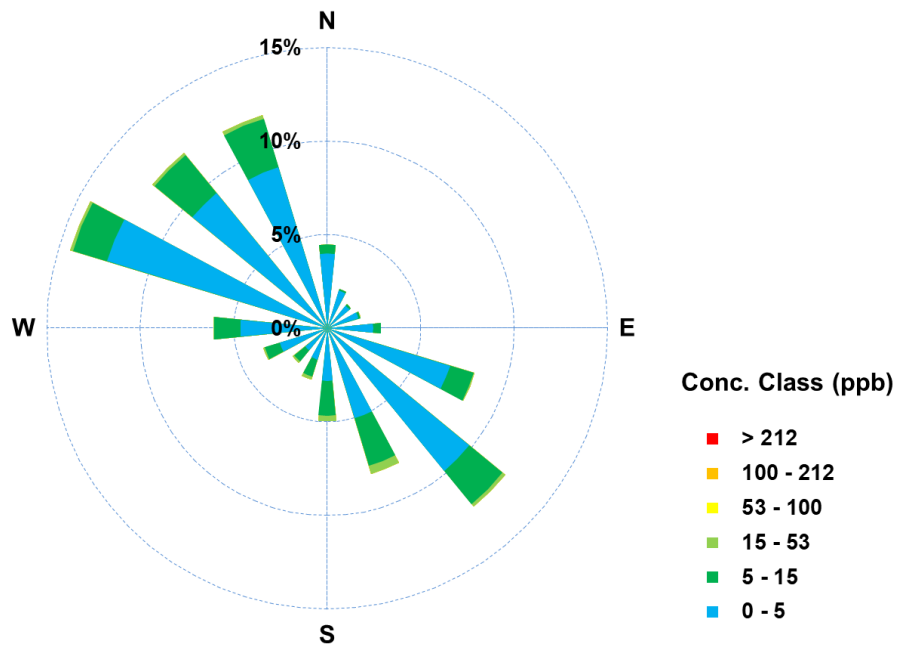


Figure 9. Pollutant rose for 1-hour average NO₂ data at the Maidstone station

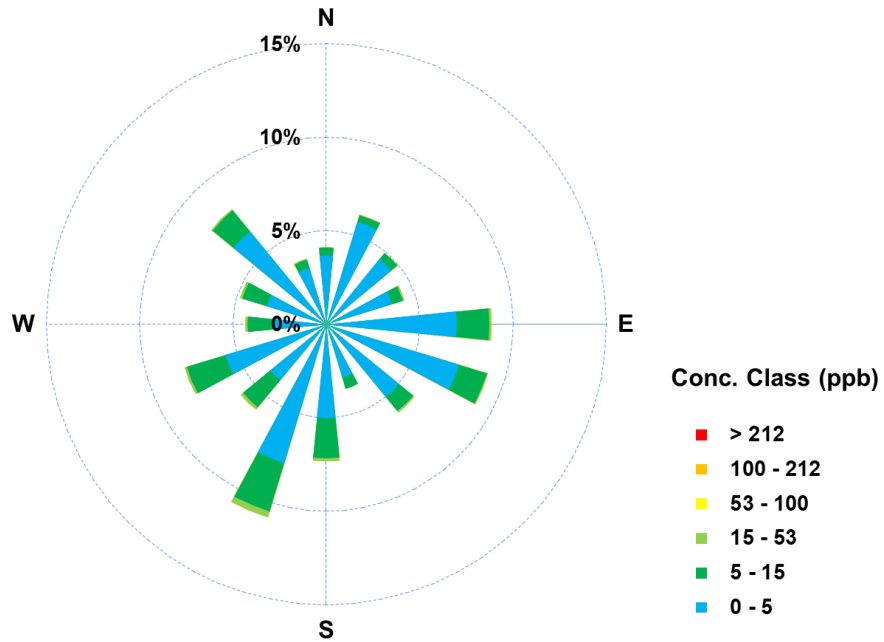


Figure 10. Pollutant rose for 1-hour average NO₂ data at the Clavet station

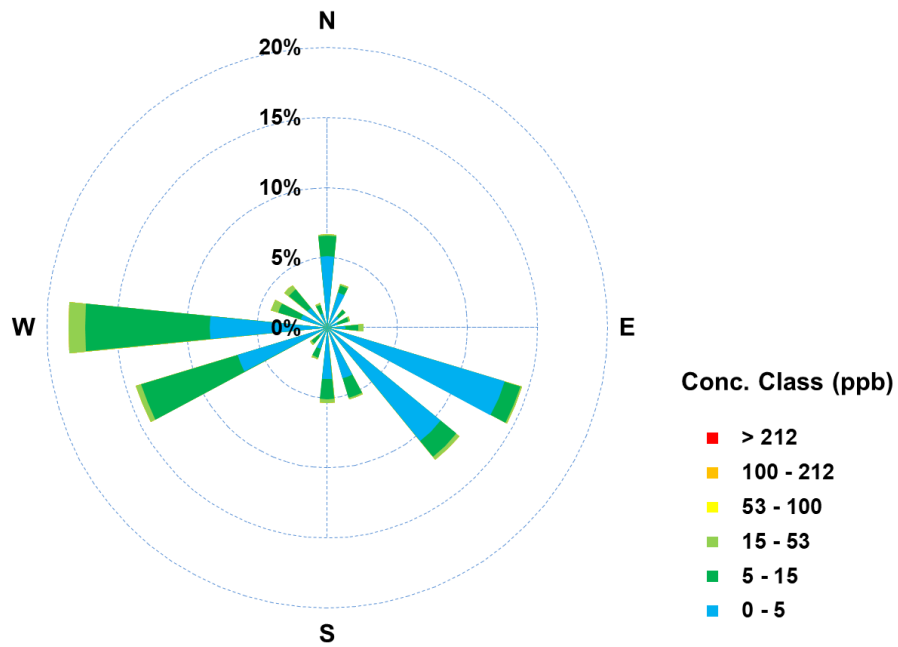


Figure 11. Pollutant rose for 1-hour average NO₂ data at the Meadow Lake City station

2.3.4 Ozone (O₃)

Ozone (O₃) is a pale blue gas, slightly soluble in water. Most people can detect a sharp odour resembling chlorine bleach at about 10 ppb concentration. Ozone can be formed by electrical discharges and high energy electromagnetic radiation. In the indoor environments, ozone can be present as a result of electronic equipment such as ionic air purifiers, laser printers, photocopiers, and arc welders.

In the ambient air, O₃ is a “secondary” pollutant, meaning it is not directly emitted from a source. Instead, ozone is produced from photochemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOC) in the presence of sunlight. Some research suggests that ground-level ozone could be from intrusion of ozone from the stratosphere, mixing from the upper troposphere, local photochemistry and the medium and long-range transport. There are split opinions regarding relative importance of these mechanisms. A study in Regina suggested that high ozone events could be due to downward transport from the stratosphere for the reviewed data.

Exposure to ozone has been linked to premature mortality and a range of morbidity health endpoints, such as hospital admissions and asthma symptoms. Acute exposure to high concentrations of ozone can cause eye irritation and breathing difficulty. Ozone can significantly impact vegetation and decrease the productivity of some crops. It damages cotton, acetate, nylon, polyester and other textile materials. Ozone can also damage other synthetic materials, cause cracks in rubber, accelerate fading of dyes, and speed deterioration of some paints and coatings.

The Saskatchewan Ambient Air Quality Standard (SAAQS) for ozone is:

- 1-hour average SAAQS = 82 ppb

The Canada-Wide Standard (CWS) for ozone is:

- 8-hour average CWS = 63 ppb; achievement evaluation is based on the 4th highest measurement annually, averaged over three consecutive years.

Table 10 presents the summary statistics for O₃ measurement results. The average concentration in 2019 was 31 ppb for Meadow Lake, with 26 ppb at Clavet. The maximum 1-hour concentration of 85 ppb and the 4th highest 8-hour running averages of 63 ppb were both detected at the Clavet station. There were 58 8-hour running averages higher than the CWS standard (see Table 11). The WYAMZ network has not collected enough data for CWS exceedance assessment.

Figures 12 to 14 present the pollutant roses for 1-hour average concentration of O₃. The measured concentration was within 20 ppb to 40 ppb range for 50-60% of the time at both stations. There was no apparent directional trend for the higher concentration events (>40 ppb). The concentration of O₃ tends to be higher in the spring months.

The detailed frequency distribution table for the pollutant roses are presented in the Appendices: Table B-5 and Table D-5.

Table 10. Summary statistics for O₃ measurement results for 2019

Monitoring Station	Annual Average	Instrument Uptime	Maximum O ₃ Conc. and Occurrence Time			
			1-hour Max.		8-hour 4 th Highest	
			ppb	%	ppb	Time
Meadow Lake ^a	31	93.0%	76	May 29 12:00	72	May 29 09:00
Clavet	26	100.0%	85	May 30 12:00	76	May 29 12:00
Meadow Lake City ^b	23	100.0% ^b	39	Dec 24 14:00	63	Dec 24 12:00

a. Parameter was monitored until November 16.

b. Parameter was operational starting November 28.

Table 11. Number of exceedance events for O₃ for 2019

Monitoring Station	No. of Exceedances of Saskatchewan O ₃ Ambient Air Quality Standard (SAAQS)	
	1-hr SAAQS	8-hr CWS
	82 ppb	63 ppb
Meadow Lake ^b	0	18 ^a
Clavet	0	40 ^a
Meadow Lake City ^c	0	0 ^a

a. These events do not constitute an exceedance because the CWS standard is based on the 4th highest measurement annually, averaged over three consecutive years.

b. Parameter was monitored until November 16.

c. Parameter was operational starting November 28.

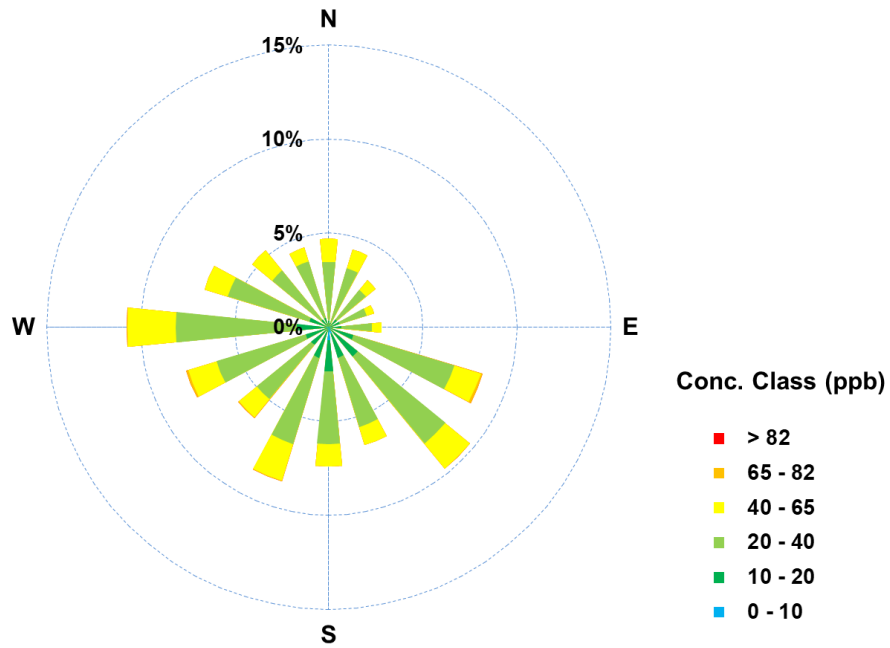


Figure 112. Pollutant rose for 1-hour average O₃ data at the Meadow Lake station

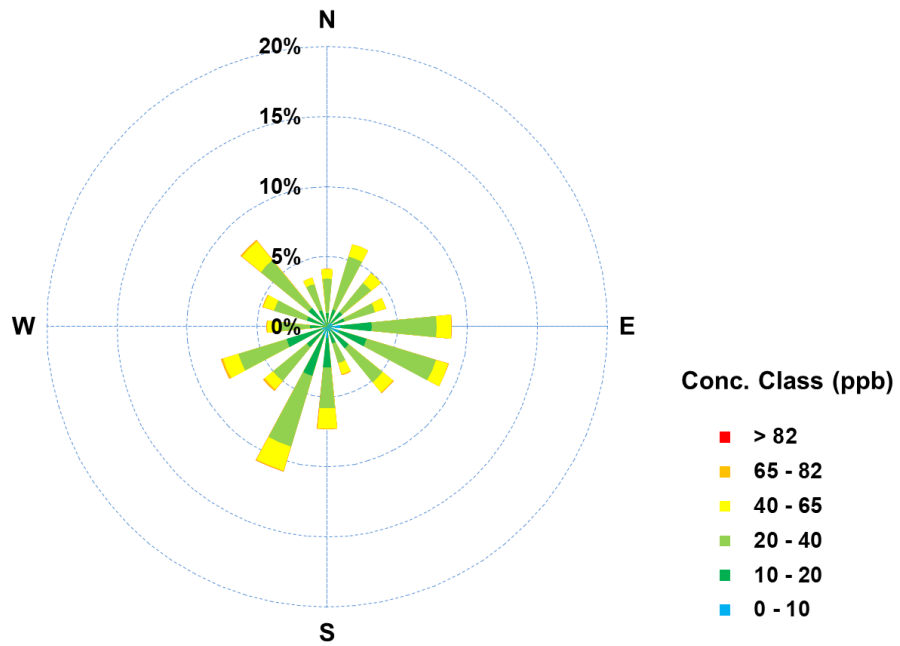


Figure 13. Pollutant rose for 1-hour average O₃ data at the Clavet station

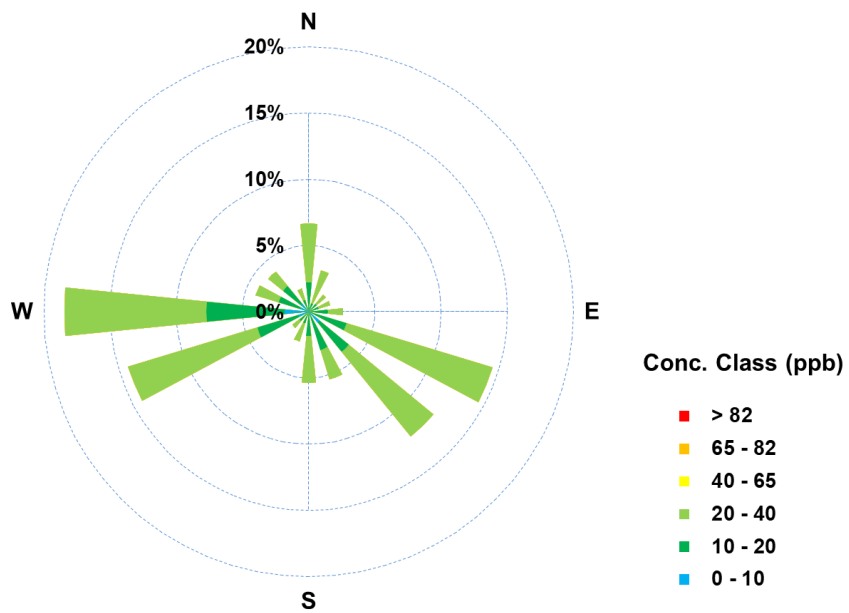


Figure 14. Pollutant rose for 1-hour average O₃ data at the Meadow Lake City station

2.3.5 Fine Particulate Matter (PM_{2.5})

Particulate matter is unique among air pollutants, as it is identified by its size rather than by its composition. The major concern for particulate matter deals with small particles referred to as inhalable particulate, or PM₁₀. PM₁₀ is defined as particles that have an aerodynamic diameter less than 10 microns (or 0.01 mm). PM₁₀ can be divided into two groups of particles based on size: fine particles and coarse particles. The fine particles are those particles with an aerodynamic diameter smaller than 2.5 microns (0.0025 mm) and are identified as PM_{2.5}. In contrast, coarse particles are those with aerodynamic diameter greater than 2.5 microns and less than 10 microns.

Fine particles are generally emitted from activities such as industrial and residential combustion, and from vehicle exhaust. Fine particles are also formed in the atmosphere when gases such as sulphur dioxide, nitrogen oxides, and volatile organic compounds, emitted by combustion activities, are transformed by chemical reactions in the air.

Adverse health effects from breathing air with a high PM_{2.5} concentration include: premature death, increased respiratory symptoms and disease, chronic bronchitis, and decreased lung function particularly for individuals with asthma. Particulate matter can clog stomatal openings of plants and interfere with photosynthesis functions, leading to growth stunting or mortality in some plant species.

Saskatchewan endorses the Canada-Wide Standards (CWS) for fine particulate matter (PM_{2.5}):

- 28 µg/m³ averaged over a 24-hour period from midnight to midnight; the standard is based on the 98th percentile annually, averaged over three consecutive years.

Table 12 presents the summary statistics for PM_{2.5} measurement results. The average concentration in 2019 ranged between 5 and 6 µg/m³. The maximum 1-hour concentration of 143 µg/m³ and the maximum 24-hour concentration of 27 µg/m³ were both detected at the Meadow Lake station. There were no exceedances of the CWS 24-hour average standard (see Table 13).

Figures 15 through 19 present the pollutant roses for PM_{2.5} measurement results. The measured concentrations were mostly less than 10 µg/m³ (85.8% to 90.6% of the time for the four stations). There was no apparent directional trend for the higher concentration events (>10 µg/m³) for the Meadow Lake and Clavet stations, while a higher occurrence frequency was observed in summer months. Higher concentration events at Maidstone occur more frequently when the wind was from the northwest and south east quadrants while Kerrobert higher concentrations were occurred when winds were from the northwest.

The detailed frequency distribution tables for the pollutant roses are presented in the Appendices: Table B-6, Table C-7, Table D-6, and Table E-4.

Table 12. Summary statistics for PM_{2.5} measurement results for 2019

Monitoring Station	Annual Average	Instrument Uptime	Maximum PM _{2.5} Conc. and Occurrence Time			
			1-hour Max.		24-hour Max.	
			µg/m ³	%	µg/m ³	Time
Meadow Lake ^a	5	92.8%	143	Jan 23 19:00	27	May-28
Maidstone	5	96.0%	102	Dec 26 18:00	24	May-30
Kerrobert	5	98.2%	72	Jun 09 10:00	25	Jun-09
Clavet	6	99.9%	78	Dec 14 17:00	22	Feb-06
Meadow Lake City ^b	6	100.0%	78	Dec 26 23:00	19	Dec-21

a. Parameter was monitored until November 16.

b. Parameter was operational starting November 28.

Table 13. Number of exceedance events for PM_{2.5} for 2019

Monitoring Station	No. of Exceedance of Canada-Wide PM _{2.5} Standards (CWS)	
	24-hr CWS	
	28 µg/m ³	
Meadow Lake ^a	0	
Maidstone	0	
Kerrobert	0	
Clavet	0	
Meadow Lake City ^b	0	

a. Parameter was monitored until November 16.

b. Parameter was operational starting November 28.

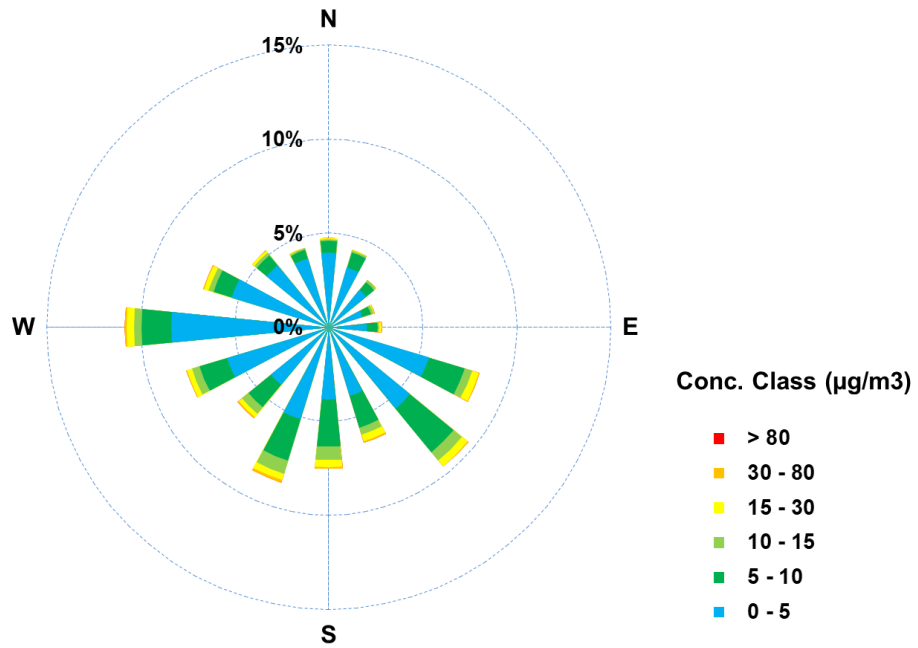


Figure 15. Pollutant rose for 1-hour average PM_{2.5} data at the Meadow Lake station

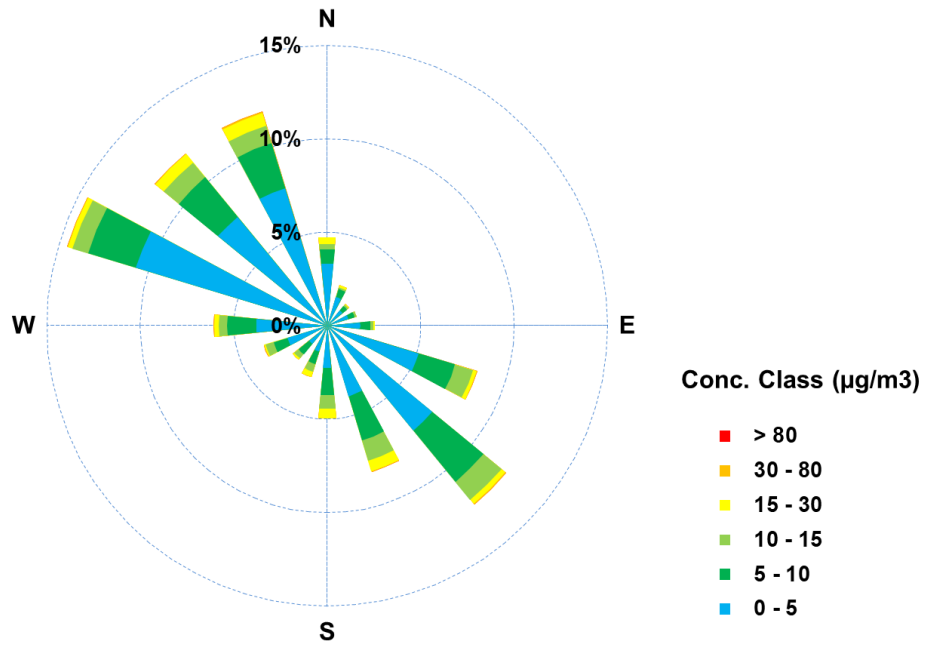


Figure 16. Pollutant rose for 1-hour average PM_{2.5} data at the Maidstone station

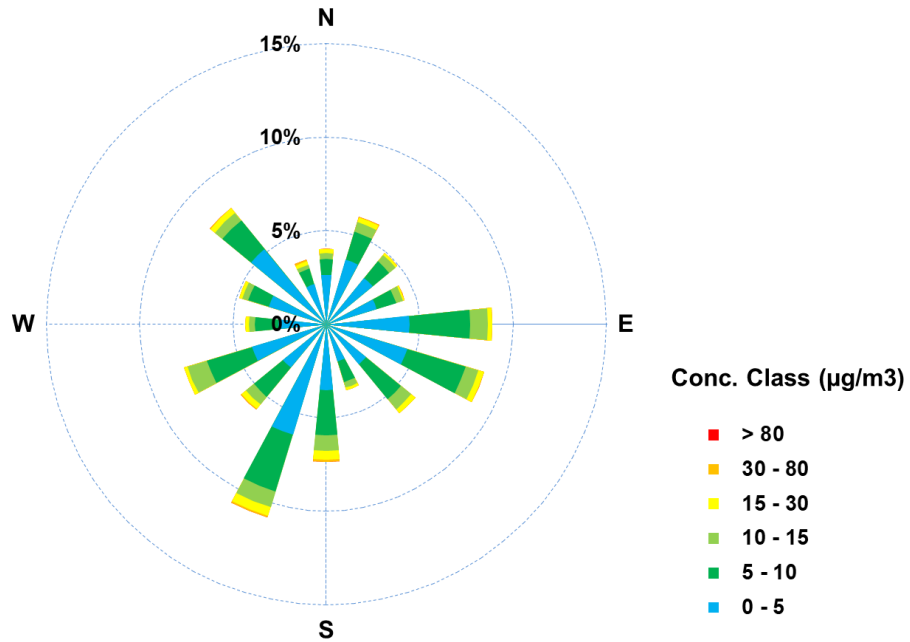


Figure 17. Pollutant rose for 1-hour average PM_{2.5} data at the Clavet station

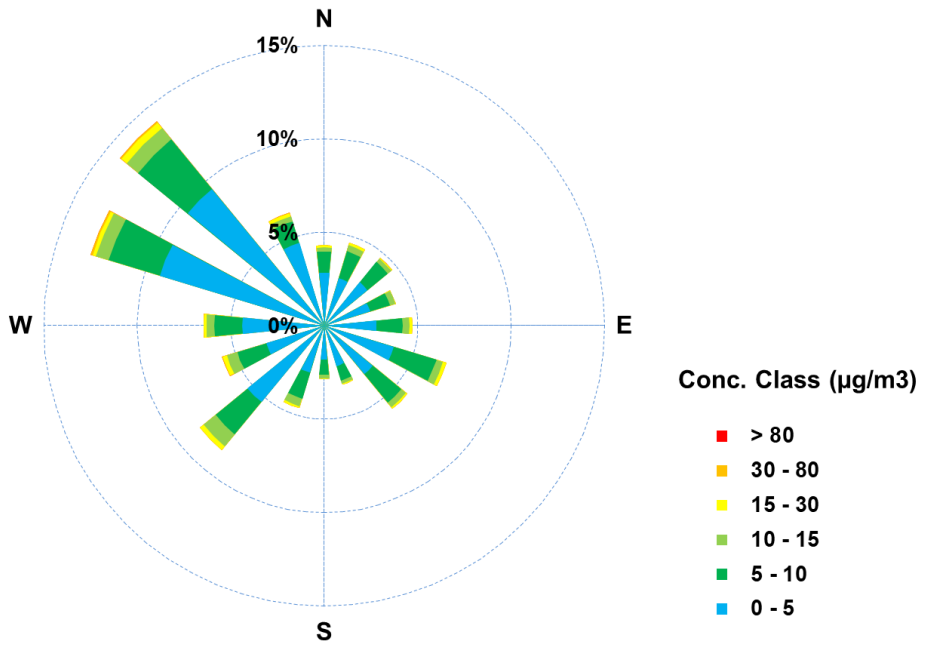


Figure 18. Pollutant rose for 1-hour average PM_{2.5} data at the Kerrobert station

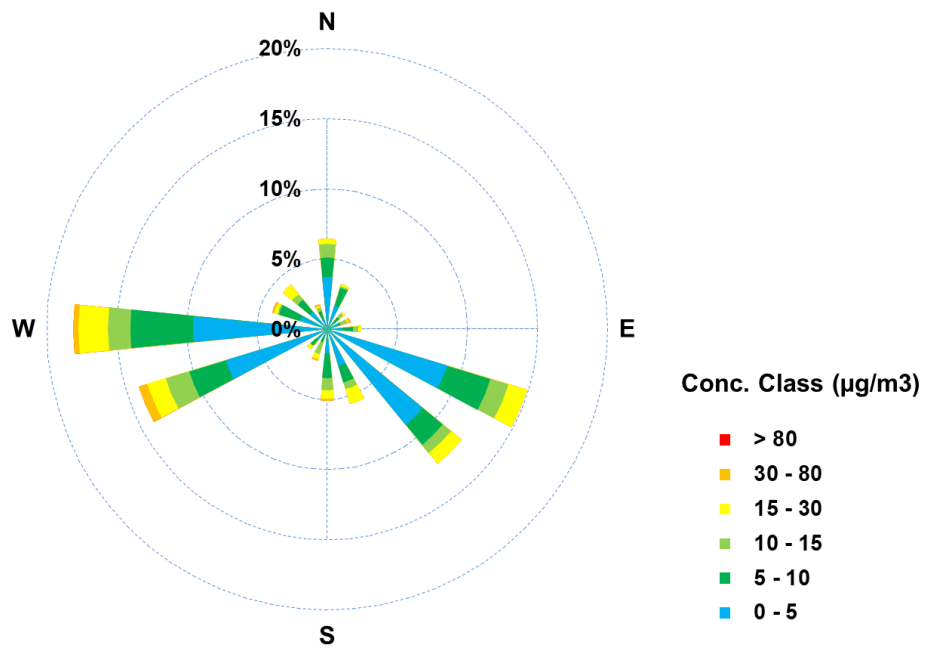


Figure 19. Pollutant rose for 1-hour average $\text{PM}_{2.5}$ data at the Meadow Lake City station

2.4 Air Quality Health Index (AQHI)

The Air Quality Health Index (AQHI) is a health protection tool that is designed to help the public make decisions to protect their health by limiting short-term exposure to air pollution and adjusting their activity levels during increased levels of air pollution. The AQHI uses readings from three air pollutants to calculate a single numerical value to evaluate the health risk associated with air pollution. The three pollutants are fine particulate matter (PM_{2.5}), nitrogen dioxide (NO₂), and ground-level ozone (O₃). All three pollutants are required to calculate AQHI. Among the WYAMZ air monitoring stations, Meadow Lake and Clavet are eligible for AQHI reporting.

Figure 20 illustrates the risk categories and the health messages for the AQHI system. The health risk is classified in four categories: Low Risk (1 to 3), Moderate Risk (4 to 6), High Risk (7 to 10), and Very High Risk (higher than 10).

Table 14 summarizes the summary statistics for AQHI rating. The air quality at both stations was rated Low Risk most of the time. The Meadow Lake station had 2.3% of time in the Moderate Risk, 0.0% of time in the High-Risk category and 0.0% in the Very High-Risk category. The Meadow Lake City station had 1.0% of time in the Moderate Risk, 0.0% of time in the High-Risk category and 0.0% in the Very High-Risk category. The Clavet station had 3.7% of time in the Moderate Risk category and 0.0% in the High-Risk category and 0.0% in the Very-High Risk category.

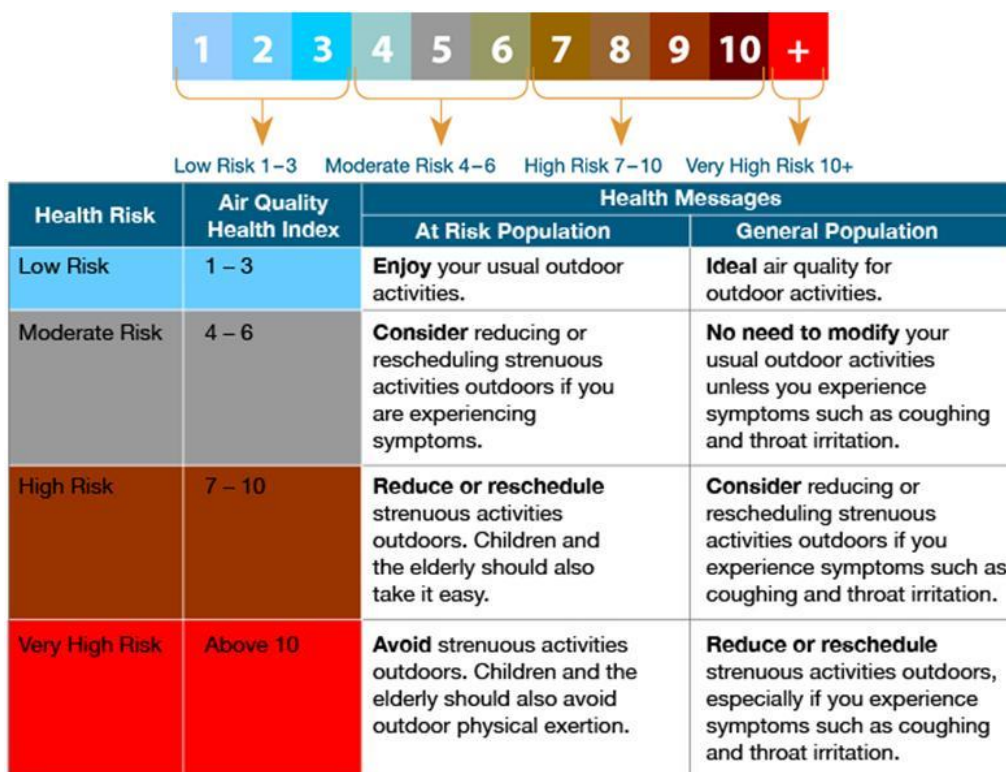


Figure 20. Health risk classification and health messages for Air Quality Health Index (Environment Canada)

Table 14. Summary of occurrence statistics for AQHI rating

Station Name	Occurrence Statistics	Occurrence Hour and Frequency by AQHI Risk Rating			
		Low Risk	Moderate Risk	High Risk	Very High Risk
Meadow Lake ^a	Occurrence Hours	7420	175	0	0
	Occurrence Frequency	97.7%	2.3%	0.0%	0.0%
Meadow Lake City ^b	Occurrence Hours	794	8	0	0
	Occurrence Frequency	99.0%	1.0%	0.0%	0.0%
Clavet	Occurrence Hours	8308	321	0	0
	Occurrence Frequency	96.3%	3.7%	0.0%	0.0%

a. Station was monitored until November 16.

b. Station was operational starting November 28.

2.5 Air Quality Index (AQI)

The Maidstone station does not meet the reporting requirements for AQHI, the Air Quality Index (AQI) is used as an alternative index. The Kerrobert station is excluded from index analysis because this station does not meet the reporting requirements of either index system.

The Air Quality Index (AQI) is a system developed to provide the public with a meaningful and comparable measure of air quality. The AQI uses readings from five major air pollutants: SO₂, NO₂, O₃, PM_{2.5}, and carbon monoxide (CO), to calculate the AQI. A minimum of three pollutants is required. The AQI is rated in four categories: Good (0 to 25), Fair (26 to 50), Poor (51 to 100), and Very Poor (>100). Table 15 summarizes the effects associated with the AQI ratings.

Table 16 summarizes the occurrence statistics for AQI rating. The air quality at the Maidstone station was rated Good for 99.7% of the time; and 0.3% was rated Fair. The Fair and Poor air quality was associated with an increased PM_{2.5} concentration.

Table 15. AQI rating and effect description

AQI	Air Quality Rating	Effect Description
0 – 25	Good	<u>Desirable Range</u> : No known harmful effects to soil, water, vegetation, animals, materials, visibility or human health. The long-term goal is for air quality to be in this range all of the time in Canada.
26 – 50	Fair	<u>Acceptable Range</u> : Adequate protection against harmful effects to soil, water, vegetation, animals, materials, visibility and human health.
51 – 100	Poor	<u>Tolerable Range</u> : Not all aspects of human health or the environment are adequately protected from possible adverse effects. Long-term control action may be necessary, depending on the frequency, duration and circumstances of the readings.
>100	Very Poor	<u>Intolerable Range</u> : Continued high readings could pose a risk to public health.

Table 16. Summary of occurrence statistics for AQI rating

Station Name	Occurrence Statistics	Occurrence Hours and Frequency by AQI Rating			
		Good	Fair	Poor	Very Poor
Maidstone	Occurrence Hours	7922	25	1	0
	Occurrence Frequency	99.7%	0.3%	0.0%	0.0%

APPENDIX A. SASKATCHEWAN AMBIENT AIR QUALITY STANDARDS

Table A-1. Saskatchewan Ambient Air Quality Standards

TABLE 20: SASKATCHEWAN AMBIENT AIR QUALITY STANDARDS ($\mu\text{g}/\text{m}^3$)				
Air Pollutant	1 Hour	8 Hours	24 Hours	Annual
Particulate Matter ($\text{PM}_{2.5}$)			28 ^a	10
Particulate Matter (PM_{10})			50	
Total Suspended Particulates (TSP)			100	60 ^b
Nitrogen Dioxide (NO_2)	300 (159 ppb)		200 (106 ppb)	45 ^c (24 ppb)
Sulphur Dioxide (SO_2)	450 (172 ppb)		125 (48 ppb)	20 ^c (8 ppb)
Hydrogen Sulphide (H_2S)	15 (11 ppb)		5 (3.6 ppb)	
Ozone (O_3)	160 (82 ppb)	124 ^d (63 ppb)		
Carbon Monoxide (CO)	15,000 (13,000 ppb)	6,000 (5,000 ppb)		

Footnotes

- (a) The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.
- (b) Geometric means
- (c) Arithmetic means
- (d) The 3-year average of the annual 4th-highest daily maximum 8-hour average concentrations.

APPENDIX B. MEADOW LAKE STATION: CONTINUOUS MONITORING DATA

Table B-1 Meadow Lake Station: Summary statistics for continuous air monitoring results for January 1 to November 16, 2019

Parameter	Unit	Calibration & AIC ^a (hours)	Valid Data (hours)	Uptime (%)	Summary Statistics for Hourly Average Data		
					Average	Minimum	Maximum
NO	ppb	360	7293	99.8%	0.2	< 0.1	27.6
NO ₂	ppb	360	7293	99.8%	0.9	< 0.1	29.6
NO _x	ppb	360	7293	99.8%	1.0	< 0.1	45.7
O ₃	ppb	361	7293	99.8%	31	< 1	76
PM _{2.5}	µg/m ³	0	7612	99.3%	5	< 1	143
Precipitation	mm	0	7655	99.8%	314.6 ^b	< 1	18.5
Ambient Temperature	°C	0	7655	99.8%	3.1	< 0.1	18.5
Relative Humidity	%	0	7655	99.8%	63	< 1	90
Wind Speed	m/s	0	7655	99.8%	1.9	Calm	7.4

a. Automatic Instrument Check

b. Total precipitation

Table B-2. Meadow Lake Station: Summary of airpointer® NO monitoring results for January 1 to November 16, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
January	707	99.2%	0.1	2.4	-	0.4	-	100.0	0.0	0.0	0.0	0.0	0.0
February	643	100.0%	0.6	26.8	-	2.9	-	98.3	1.4	0.3	0.0	0.0	0.0
March	697	100.0%	0.3	6.5	-	1.7	-	99.7	0.3	0.0	0.0	0.0	0.0
April	689	100.0%	0.1	0.7	-	0.2	-	100.0	0.0	0.0	0.0	0.0	0.0
May	711	100.0%	0.1	2.0	-	0.2	-	100.0	0.0	0.0	0.0	0.0	0.0
June	682	99.9%	0.1	2.1	-	0.3	-	100.0	0.0	0.0	0.0	0.0	0.0
July	712	100.0%	0.1	4.1	-	0.3	-	100.0	0.0	0.0	0.0	0.0	0.0
August	708	99.6%	0.1	1.2	-	0.3	-	100.0	0.0	0.0	0.0	0.0	0.0
September	680	100.0%	0.1	2.0	-	0.3	-	100.0	0.0	0.0	0.0	0.0	0.0
October	712	100.0%	0.2	27.6	-	1.6	-	99.7	0.1	0.1	0.0	0.0	0.0
November	352	99.2%	0.2	1.6	-	0.4	-	100.0	0.0	0.0	0.0	0.0	0.0
December	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual ^c	7293	99.8%	0.2	27.6	-	2.9	-	99.8	0.2	0.0	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

Table B-3. Meadow Lake Station: Summary of airpointer® NO₂ monitoring results for January 1 to November 16, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
January	707	99.2%	1.4	9.0	0	3.5	-	97.1	2.9	0.0	0.0	0.0	0.0
February	643	100.0%	2.3	29.6	0	4.8	-	89.4	9.6	0.9	0.0	0.0	0.0
March	697	100.0%	1.2	13.1	0	3.5	-	98.9	1.1	0.0	0.0	0.0	0.0
April	689	100.0%	0.5	2.6	0	1.1	-	100.0	0.0	0.0	0.0	0.0	0.0
May	711	100.0%	0.6	3.7	0	1.6	-	100.0	0.0	0.0	0.0	0.0	0.0
June	682	99.9%	0.7	3.1	0	1.6	-	100.0	0.0	0.0	0.0	0.0	0.0
July	712	100.0%	0.4	6.6	0	0.6	-	99.9	0.1	0.0	0.0	0.0	0.0
August	708	99.6%	0.4	1.8	0	0.6	-	100.0	0.0	0.0	0.0	0.0	0.0
September	680	100.0%	0.4	2.3	0	0.7	-	100.0	0.0	0.0	0.0	0.0	0.0
October	712	100.0%	0.8	10.7	0	2.3	-	99.7	0.3	0.0	0.0	0.0	0.0
November	352	99.2%	1.3	5.2	0	3.4	-	99.4	0.6	0.0	0.0	0.0	0.0
December	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual ^c	7293	99.8%	0.9	29.6	0	4.8	-	98.6	1.3	0.1	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 212 ppb

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. Annual Saskatchewan Ambient Air Quality Standard = 53 ppb

Table B-4. Meadow Lake Station: Summary of airpointer® NOx monitoring results for January 1 to November 16, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
January	707	99.2%	1.5	11.4	-	3.9	-	96.4	3.6	0.0	0.0	0.0	0.0
February	643	100.0%	2.9	45.7	-	7.1	-	83.5	15.1	1.4	0.0	0.0	0.0
March	697	100.0%	1.5	15.2	-	5.0	-	96.8	3.0	0.1	0.0	0.0	0.0
April	689	100.0%	0.6	2.9	-	1.3	-	100.0	0.0	0.0	0.0	0.0	0.0
May	711	100.0%	0.6	5.1	-	1.5	-	99.9	0.1	0.0	0.0	0.0	0.0
June	682	99.9%	0.9	4.4	-	1.8	-	100.0	0.0	0.0	0.0	0.0	0.0
July	712	100.0%	0.5	10.7	-	0.7	-	99.9	0.1	0.0	0.0	0.0	0.0
August	708	99.6%	0.5	2.5	-	0.8	-	100.0	0.0	0.0	0.0	0.0	0.0
September	680	100.0%	0.5	3.5	-	0.8	-	100.0	0.0	0.0	0.0	0.0	0.0
October	712	100.0%	0.9	38.2	-	3.4	-	99.7	0.1	0.1	0.0	0.0	0.0
November	352	99.2%	1.5	6.5	-	3.7	-	97.4	2.6	0.0	0.0	0.0	0.0
December	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual ^c	7293	99.8%	1.0	45.7	-	7.1	-	97.7	2.1	0.2	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

Table B-5. Meadow Lake Station: Summary of airpointer® O₃ monitoring results for January 1 to November 16, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 8-Hr Conc. (ppb)	8-Hour Conc. Above CWS ^b (no.)	Percent of Data in each Concentration Range					
								≤10	10 - 20	20 - 40	40 - 65	65 - 82	>82
January	731	99.2%	30	43	0	42	0	3.3	5.2	89.2	2.3	0.0	0.0
February	643	100.0%	32	43	0	41	0	0.2	1.7	96.1	2.0	0.0	0.0
March	697	100.0%	43	63	0	61	0	0.0	0.9	35.9	63.3	0.0	0.0
April	689	100.0%	41	64	0	60	0	0.0	1.9	40.2	57.9	0.0	0.0
May	711	100.0%	42	76	0	73	12	0.0	1.8	44.7	50.8	2.7	0.0
June	682	99.9%	33	73	0	69	6	1.9	14.7	55.1	27.0	1.3	0.0
July	709	99.6%	26	54	0	44	0	4.7	22.3	66.6	6.5	0.0	0.0
August	711	100.0%	23	44	0	39	0	3.9	32.5	62.9	0.7	0.0	0.0
September	680	100.0%	21	44	0	38	0	7.8	36.8	54.9	0.6	0.0	0.0
October	712	100.0%	22	40	0	37	0	3.9	35.1	60.8	0.1	0.0	0.0
November	352	99.4%	25	33	0	32	0	1.4	21.0	77.6	0.0	0.0	0.0
December	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual ^c	7293	99.8%	31	76	0	73	18	2.5	15.6	61.4	20.1	0.4	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 82 ppb

b. 8-hour Canada-Wide Standard = 65 ppb

c. No annual Saskatchewan Ambient Air Quality Standard

Table B-6. Meadow Lake Station: Summary of airpointer® PM_{2.5} monitoring results for January 1 to November 16, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (µg/m ³)	Maximum 1-Hr Conc. (µg/m ³)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (µg/m ³)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 10	10 - 15	15 - 30	30 - 80	>80
January	738	99.2%	4	143	-	11	0	76	18	2	3	0	0
February	672	100.0%	5	43	-	10	0	66	23	7	3	1	0
March	698	93.8%	4	22	-	7	0	81	12	4	3	0	0
April	720	100.0%	3	23	-	5	0	87	12	1	0	0	0
May	744	100.0%	8	72	-	27	0	55	21	11	10	3	0
June	720	100.0%	7	56	-	17	0	48	30	11	9	1	0
July	744	100.0%	5	39	-	11	0	62	28	6	4	0	0
August	744	100.0%	5	62	-	11	0	58	33	5	3	0	0
September	720	100.0%	4	73	-	8	0	80	18	1	1	0	0
October	744	100.0%	3	31	-	8	0	83	14	3	1	0	0
November	368	99.5%	4	19	-	9	0	68	25	6	1	0	0
December	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual ^c	7612	99.3%	5	143	-	27	0	69.3	21.3	5.1	3.5	0.7	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24-hour Canada-Wide Standard = 30 µg/m³

c. No annual Saskatchewan Ambient Air Quality Standard

Table B-7. Meadow Lake Station: Summary of airpointer® precipitation monitoring results for January 1 to November 16, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Total Precip. (mm)	Maximum 1-Hr Precip. (mm)	Maximum 24-Hr Precip. (mm)	Percent of Data in each Precipitation Range					
						≤5	5 - 10	10 - 25	25 - 50	50 - 75	>75
January	738	99.2%	4.8	1.2	4.2	100.0	0.0	0.0	0.0	0.0	0.0
February	672	100.0%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
March	744	100.0%	0.1	0.1	0.1	100.0	0.0	0.0	0.0	0.0	0.0
April	720	100.0%	19.7	3.3	11.0	100.0	0.0	0.0	0.0	0.0	0.0
May	744	100.0%	4.5	0.7	1.3	100.0	0.0	0.0	0.0	0.0	0.0
June	720	100.0%	73.9	11.3	14.5	99.6	0.3	0.1	0.0	0.0	0.0
July	744	100.0%	157.2	18.5	21.7	98.5	1.1	0.4	0.0	0.0	0.0
August	744	100.0%	25.6	7.8	8.6	99.9	0.1	0.0	0.0	0.0	0.0
September	717	99.6%	22.9	7.5	14.6	99.7	0.3	0.0	0.0	0.0	0.0
October	744	100.0%	5.7	0.9	1.9	100.0	0.0	0.0	0.0	0.0	0.0
November	368	99.5%	0.3	0.3	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
December	-	-	-	-	-	-	-	-	-	-	-
Annual	7655	99.8%	314.6	18.5	21.7	99.8	0.2	0.1	0.0	0.0	0.0

Table B-8. Meadow Lake Station: Summary of airpointer® ambient temperature monitoring results for January 1 to November 16, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Temp. (°C)	Minimum 1-Hr Temp. (°C)	Maximum 1-Hr Temp. (°C)	Percent of Data in each Temperature Range					
						≤-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
January	738	99.2%	-13.4	-33.3	7.9	2.2	40.0	52.6	5.1	0.0	0.0
February	672	100.0%	-21.7	-37.0	-4.0	9.5	72.3	18.2	0.0	0.0	0.0
March	744	100.0%	-3.4	-29.1	15.0	0.0	14.2	41.5	44.2	0.0	0.0
April	720	100.0%	4.1	-8.6	21.0	0.0	0.0	24.3	72.2	3.5	0.0
May	744	100.0%	10.0	-8.0	30.3	0.0	0.0	11.6	60.8	27.4	0.3
June	720	100.0%	15.0	4.1	24.9	0.0	0.0	0.0	53.9	46.1	0.0
July	744	100.0%	16.8	5.8	30.7	0.0	0.0	0.0	37.9	61.6	0.5
August	744	100.0%	14.8	0.0	28.8	0.0	0.0	0.1	52.2	47.7	0.0
September	717	99.6%	11.1	-3.1	25.1	0.0	0.0	0.8	76.3	22.9	0.0
October	744	100.0%	1.8	-13.8	17.8	0.0	0.0	31.9	67.3	0.8	0.0
November	368	99.5%	-7.5	-20.7	4.2	0.0	13.3	74.2	12.5	0.0	0.0
December	-	-	-	-	-	-	-	-	-	-	-
Annual	7655	99.8%	3.1	-37.0	30.7	1.1	12.3	21.0	45.5	20.1	0.1

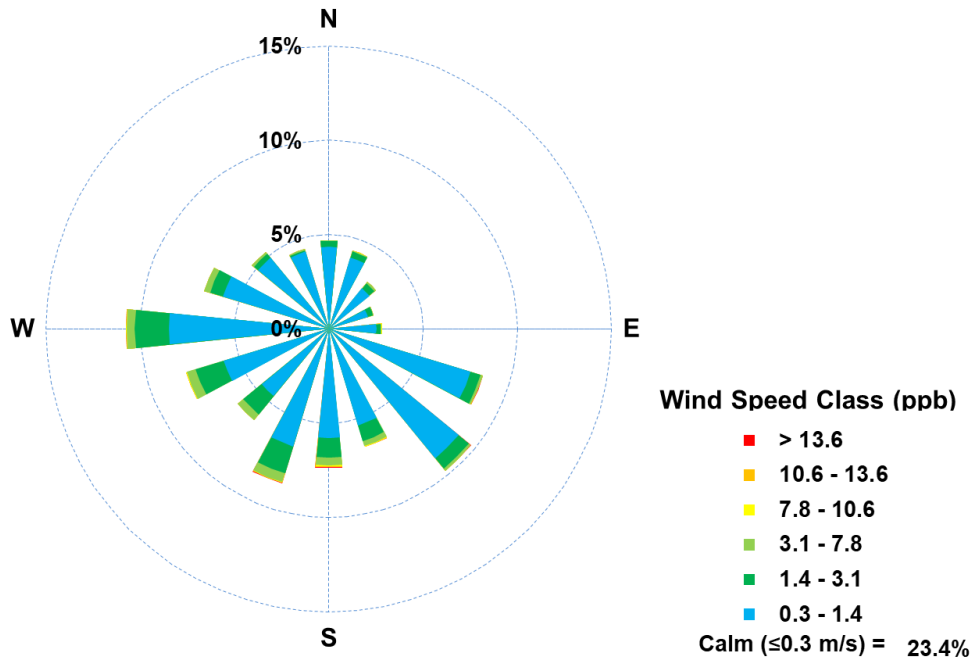
Table B-9. Meadow Lake Station: Summary of airpointer® relative humidity monitoring results for January 1 to November 16, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average RH (%)	Minimum 1-Hr RH (%)	Maximum 1-Hr RH (%)	Percent of Data in each Relative Humidity Range					
						≤15	15 - 30	30 - 60	60 - 80	80 - 90	>90
January	738	99.2%	66	44	85	3.1	0.0	12.2	79.3	5.4	0.0
February	672	100.0%	63	38	74	0.0	0.0	21.3	78.7	0.0	0.0
March	744	100.0%	56	28	85	0.0	1.2	61.6	35.2	2.0	0.0
April	720	100.0%	53	16	87	0.0	12.6	49.9	28.1	9.4	0.0
May	744	100.0%	49	16	88	0.0	22.8	45.3	24.2	7.7	0.0
June	720	100.0%	64	21	90	0.0	2.2	36.0	35.8	25.8	0.1
July	744	100.0%	70	35	90	0.0	0.0	28.0	38.0	33.2	0.8
August	744	100.0%	69	37	90	0.1	0.0	29.4	42.7	27.4	0.3
September	717	99.6%	70	30	90	0.0	0.0	25.9	40.2	33.2	0.7
October	744	100.0%	66	26	88	0.0	0.7	29.4	51.2	18.7	0.0
November	368	99.5%	68	38	86	0.0	0.0	19.3	73.1	7.6	0.0
December	-	-	-	-	-	-	-	-	-	-	-
Annual	7655	99.8%	63	16	90	0.3	3.8	33.2	46.5	15.9	0.2

Table B-10 Meadow Lake Station: Wind frequency table for January 1 to November 16, 2019

Wind Direction Sector	Percent of Data within Wind Speed Range, wind speed unit m/s						Totals
	0.3 - 1.4	1.4 - 3.1	3.1 - 7.8	7.8 - 10.6	10.6 - 13.6	>13.6	
North NorthEast	1.1%	1.7%	1.3%	0.0%	0.0%	0.0%	4.1%
NorthEast	1.0%	1.4%	0.7%	0.0%	0.0%	0.0%	3.1%
East NorthEast	0.9%	1.1%	0.5%	0.0%	0.0%	0.0%	2.5%
East	1.3%	1.1%	0.2%	0.0%	0.0%	0.0%	2.7%
East SouthEast	2.2%	4.4%	1.6%	0.0%	0.0%	0.0%	8.2%
SouthEast	4.1%	4.4%	0.9%	0.0%	0.0%	0.0%	9.4%
South SouthEast	5.3%	0.7%	0.0%	0.0%	0.0%	0.0%	6.0%
South	6.5%	0.5%	0.0%	0.0%	0.0%	0.0%	7.1%
South SouthWest	4.9%	3.2%	0.2%	0.0%	0.0%	0.0%	8.4%
SouthWest	3.1%	2.8%	0.2%	0.0%	0.0%	0.0%	6.0%
West SouthWest	2.4%	4.1%	1.2%	0.0%	0.0%	0.0%	7.7%
West	2.3%	5.2%	3.1%	0.0%	0.0%	0.0%	10.6%
West NorthWest	1.6%	3.5%	1.8%	0.0%	0.0%	0.0%	6.8%
NorthWest	1.2%	2.1%	1.9%	0.0%	0.0%	0.0%	5.2%
North NorthWest	0.9%	2.0%	1.3%	0.0%	0.0%	0.0%	4.3%
North	1.0%	1.5%	2.1%	0.0%	0.0%	0.0%	4.6%
Total	39.9%	39.8%	17.0%	0.0%	0.0%	0.0%	96.7%

Percent Calm (≤ 0.3 m/s)	3.3%
Number of Valid Hourly-Average Data	7644
Total Workable Hours in Time Period	7654



APPENDIX C. MAIDSTONE STATION: CONTINUOUS MONITORING DATA

Table C-1 Maidstone Station: Summary statistics for continuous air monitoring results for 2019

Parameter	Unit	Calibration & AIC ^a (hours)	Valid Data (hours)	Uptime (%)	Summary Statistics for Hourly Average Data		
					Average	Minimum	Maximum
SO ₂	ppb	405	8275	99.0%	0.4	< 0.1	17.8
H ₂ S	ppb	405	8275	99.0%	0.3	< 0.1	13.3
NO	ppb	405	8275	99.0%	0.8	< 0.1	28.2
NO ₂	ppb	405	8275	99.0%	3.5	< 0.1	27.2
NO _x	ppb	405	8275	99.0%	4.2	< 0.1	45.0
PM _{2.5}	µg/m ³	0	8400	95.9%	5	< 1	102
Precipitation	mm	0	8743	99.8%	241.2 ^b	< 0.1	9.8
Ambient Temperature	°C	0	8743	99.8%	1.1	-42.7	30.2
Relative Humidity	%	0	8740	99.8%	66	< 1	91
Wind Speed	m/s	0	8731	99.7%	2.0	Calm	8.4

a. Automatic Instrument Check

b. Total precipitation

Table C-2. Maidstone Station: Summary of airpointer® SO₂ monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤1	1 -5	5 - 11	11 - 57	57 - 172	>172
January	708	99.3%	0.8	7.4	0	3.6	0	76.4	21.2	2.5	0.0	0.0	0.0
February	643	99.8%	1.0	12.3	0	3.1	0	70.9	26.1	2.8	0.2	0.0	0.0
March	704	100.0%	0.6	8.2	0	2.0	0	85.8	13.1	1.1	0.0	0.0	0.0
April	689	100.0%	0.3	11.7	0	1.1	0	94.5	5.2	0.1	0.1	0.0	0.0
May	647	90.6%	0.3	5.3	0	0.9	0	93.7	6.0	0.3	0.0	0.0	0.0
June	680	99.7%	0.3	7.2	0	1.7	0	95.9	3.4	0.7	0.0	0.0	0.0
July	707	99.3%	0.3	7.1	0	1.1	0	96.6	3.1	0.3	0.0	0.0	0.0
August	712	100.0%	0.3	5.9	0	1.2	0	93.1	6.3	0.6	0.0	0.0	0.0
September	681	100.0%	0.2	2.7	0	0.6	0	96.6	3.4	0.0	0.0	0.0	0.0
October	712	100.0%	0.2	4.8	0	0.9	0	95.6	4.4	0.0	0.0	0.0	0.0
November	689	100.0%	0.1	3.8	0	0.5	0	99.1	0.9	0.0	0.0	0.0	0.0
December	703	100.0%	0.5	17.8	0	2.1	0	90.9	8.5	0.4	0.1	0.0	0.0
Annual ^c	8275	99.0%	0.4	17.8	0	3.6	0	90.8	8.4	0.7	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 172 ppb

b. 24-hour Saskatchewan Ambient Air Quality Standard = 57 ppb

c. Annual Saskatchewan Ambient Air Quality Standard = 11 ppb

Table C-3. Maidstone Station: Summary of airpointer® H₂S monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤1	1 - 3.6	3.6 - 5	5 - 8	8 - 10.8	>10.8
January	708	99.3%	0.1	1.7	0	0.6	0	99.6	0.4	0.0	0.0	0.0	0.0
February	643	99.8%	0.2	1.6	0	0.5	0	98.6	1.4	0.0	0.0	0.0	0.0
March	704	100.0%	0.1	1.8	0	0.5	0	98.9	1.1	0.0	0.0	0.0	0.0
April	689	100.0%	0.1	1.3	0	0.2	0	99.9	0.1	0.0	0.0	0.0	0.0
May	647	90.6%	0.2	6.6	0	0.7	0	95.5	4.2	0.2	0.2	0.0	0.0
June	680	99.7%	0.5	12.5	1	2.1	0	86.6	11.9	0.3	0.7	0.3	0.1
July	707	99.3%	0.5	11.6	1	1.5	0	88.0	9.2	1.6	1.0	0.1	0.1
August	712	100.0%	0.5	13.3	1	1.9	0	87.8	11.5	0.1	0.1	0.3	0.1
September	681	100.0%	0.5	9.9	0	2.0	0	86.9	12.0	0.7	0.0	0.3	0.0
October	712	100.0%	0.1	1.5	0	0.5	0	99.7	0.3	0.0	0.0	0.0	0.0
November	688	99.9%	0.1	0.5	0	0.2	0	100.0	0.0	0.0	0.0	0.0	0.0
December	703	100.0%	0.1	1.7	0	0.5	0	99.7	0.3	0.0	0.0	0.0	0.0
Annual ^c	8274	99.0%	0.3	13.3	3	2.1	0	95.1	4.4	0.2	0.2	0.1	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 10.8 ppb

b. 24-hour Saskatchewan Ambient Air Quality Standard = 3.6 ppb

c. No annual Saskatchewan Ambient Air Quality Standard

Table C-4. Maidstone Station: Summary of airpointer® NO monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
January	708	99.3%	1.1	23.7	-	13.0	-	95.2	3.8	1.0	0.0	0.0	0.0
February	643	99.8%	1.7	28.2	-	7.0	-	90.4	7.6	2.0	0.0	0.0	0.0
March	704	100.0%	0.7	14.7	-	2.6	-	98.3	1.7	0.0	0.0	0.0	0.0
April	689	100.0%	0.3	7.4	-	1.0	-	99.6	0.4	0.0	0.0	0.0	0.0
May	647	90.6%	0.3	5.8	-	0.8	-	99.8	0.2	0.0	0.0	0.0	0.0
June	680	99.7%	0.4	3.3	-	0.8	-	100.0	0.0	0.0	0.0	0.0	0.0
July	707	99.3%	0.5	16.0	-	2.2	-	98.3	1.6	0.1	0.0	0.0	0.0
August	712	100.0%	0.8	22.3	-	3.7	-	97.5	2.1	0.4	0.0	0.0	0.0
September	681	100.0%	0.7	19.4	-	2.9	-	97.5	2.2	0.3	0.0	0.0	0.0
October	712	100.0%	0.7	10.6	-	2.0	-	98.0	2.0	0.0	0.0	0.0	0.0
November	689	100.0%	0.7	12.5	-	2.3	-	98.5	1.5	0.0	0.0	0.0	0.0
December	703	100.0%	1.3	26.0	-	6.6	-	93.7	5.7	0.6	0.0	0.0	0.0
Annual ^c	8275	99.0%	0.8	28.2	-	13.0	-	97.3	2.4	0.4	0.0	0.0	0.0

- a. No 1-hour Saskatchewan Ambient Air Quality Standard
- b. No 24-hour Saskatchewan Ambient Air Quality Standard
- c. No annual Saskatchewan Ambient Air Quality Standard

Table C-5. Maidstone Station: Summary of airpointer® NO₂ monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
January	708	99.3%	5.9	27.2	0	22.9	-	59.7	31.6	8.7	0.0	0.0	0.0
February	643	99.8%	5.8	22.4	0	15.3	-	52.4	40.6	7.0	0.0	0.0	0.0
March	704	100.0%	4.6	20.8	0	11.8	-	62.8	36.2	1.0	0.0	0.0	0.0
April	689	100.0%	2.5	16.8	0	5.5	-	89.6	10.3	0.1	0.0	0.0	0.0
May	647	90.6%	2.7	12.9	0	5.4	-	85.3	14.7	0.0	0.0	0.0	0.0
June	680	99.7%	2.7	15.7	0	5.4	-	85.9	14.0	0.1	0.0	0.0	0.0
July	707	99.3%	1.4	7.6	0	3.2	-	95.8	4.2	0.0	0.0	0.0	0.0
August	712	100.0%	1.4	9.0	0	3.1	-	97.6	2.4	0.0	0.0	0.0	0.0
September	681	100.0%	1.9	13.5	0	3.8	-	93.4	6.6	0.0	0.0	0.0	0.0
October	712	100.0%	3.0	17.1	0	7.3	-	82.6	17.0	0.4	0.0	0.0	0.0
November	689	100.0%	3.8	16.1	0	7.8	-	73.7	26.1	0.1	0.0	0.0	0.0
December	703	100.0%	6.1	19.9	0	14.6	-	53.8	41.3	5.0	0.0	0.0	0.0
Annual ^c	8275	99.0%	3.5	27.2	0	22.9	-	77.7	20.4	1.9	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 212 ppb

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. Annual Saskatchewan Ambient Air Quality Standard = 53 ppb

Table C-6. Maidstone Station: Summary of airpointer® NOx monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
January	708	99.3%	7.0	45.0	-	35.9	-	55.6	34.2	10.2	0.0	0.0	0.0
February	643	99.8%	7.5	41.2	-	22.0	-	44.2	42.6	13.2	0.0	0.0	0.0
March	704	100.0%	5.2	26.9	-	13.5	-	57.1	40.3	2.6	0.0	0.0	0.0
April	689	100.0%	2.8	17.0	-	6.2	-	87.8	11.6	0.6	0.0	0.0	0.0
May	647	90.6%	2.9	15.4	-	6.2	-	82.2	17.6	0.2	0.0	0.0	0.0
June	680	99.7%	3.2	18.2	-	5.8	-	79.9	20.0	0.1	0.0	0.0	0.0
July	707	99.3%	1.9	22.9	-	3.7	-	91.9	7.5	0.6	0.0	0.0	0.0
August	712	100.0%	2.1	26.6	-	6.1	-	89.5	9.7	0.8	0.0	0.0	0.0
September	681	100.0%	2.7	24.0	-	5.5	-	85.9	12.8	1.3	0.0	0.0	0.0
October	712	100.0%	3.8	24.3	-	9.3	-	77.2	21.6	1.1	0.0	0.0	0.0
November	689	100.0%	4.5	26.3	-	9.3	-	66.8	32.1	1.2	0.0	0.0	0.0
December	703	100.0%	7.4	39.9	-	21.2	-	46.9	42.1	11.0	0.0	0.0	0.0
Annual ^c	8275	99.0%	4.2	45.0	-	35.9	-	72.1	24.3	3.6	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

Table C-7. Maidstone Station: Summary of airpointer® PM_{2.5} monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (µg/m ³)	Maximum 1-Hr Conc. (µg/m ³)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (µg/m ³)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 10	10 - 15	15 - 30	30 - 80	>80
January	739	99.3%	4	30	-	16	0	63.8	22.4	10.5	3.1	0.1	0.0
February	672	100.0%	6	46	-	17	0	56.8	22.0	13.1	7.9	0.1	0.0
March	694	93.3%	6	34	-	20	0	57.9	24.1	11.2	6.3	0.4	0.0
April	720	100.0%	4	14	-	8	0	72.8	25.8	1.4	0.0	0.0	0.0
May	744	100.0%	8	54	-	24	0	42.5	25.4	18.3	13.0	0.8	0.0
June	659	91.5%	6	36	-	18	0	55.1	24.9	11.2	7.7	1.1	0.0
July	739	99.3%	5	28	-	9	0	65.4	21.8	9.9	3.0	0.0	0.0
August	742	99.7%	5	27	-	11	0	59.8	33.3	5.0	1.9	0.0	0.0
September	483	67.1%	3	27	-	10	0	78.5	18.2	2.7	0.6	0.0	0.0
October	744	100.0%	4	49	-	11	0	76.1	15.9	5.1	2.8	0.1	0.0
November	720	100.0%	5	39	-	19	0	67.4	25.0	5.8	0.7	1.1	0.0
December	744	100.0%	7	102	-	14	0	56.2	21.9	15.6	5.6	0.5	0.1
Annual ^c	8400	95.9%	5	102	-	24	0	62.3	23.5	9.3	4.5	0.4	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24-hour Canada-Wide Standard = 28 µg/m³

c. No annual Saskatchewan Ambient Air Quality Standard

Table C-8. Maidstone Station: Summary of airpointer® precipitation monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Total Precip. (mm)	Maximum 1-Hr Precip. (mm)	Maximum 24-Hr Precip. (mm)	Percent of Data in each Precipitation Range					
						≤5	5 - 10	10 - 25	25 - 50	50 - 75	>75
January	739	99.3%	1.6	1.4	1.4	100.0	0.0	0.0	0.0	0.0	0.0
February	672	100.0%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
March	744	100.0%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
April	720	100.0%	10.9	3.3	8.2	100.0	0.0	0.0	0.0	0.0	0.0
May	742	99.7%	12.4	4.2	8.5	100.0	0.0	0.0	0.0	0.0	0.0
June	720	100.0%	58.7	4.6	10.8	100.0	0.0	0.0	0.0	0.0	0.0
July	739	99.3%	92.2	9.8	25.2	99.3	0.7	0.0	0.0	0.0	0.0
August	744	100.0%	34.7	4.0	9.9	100.0	0.0	0.0	0.0	0.0	0.0
September	720	100.0%	21.5	5.6	5.7	99.9	0.1	0.0	0.0	0.0	0.0
October	744	100.0%	2.9	0.6	1.5	100.0	0.0	0.0	0.0	0.0	0.0
November	720	100.0%	6.4	1.9	3.8	100.0	0.0	0.0	0.0	0.0	0.0
December	739	99.3%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
Annual	8743	99.8%	241.2	9.8	25.2	99.9	0.1	0.0	0.0	0.0	0.0

Table C-9. Maidstone Station: Summary of airpointer® ambient temperature monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Temp. (°C)	Minimum 1-Hr Temp. (°C)	Maximum 1-Hr Temp. (°C)	Percent of Data in each Temperature Range					
						≤-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
January	739	99.3%	-13.3	-35.5	6.0	2.5	41.7	51.4	4.5	0.0	0.0
February	672	100.0%	-24.3	-42.7	-4.3	24.9	63.4	11.8	0.0	0.0	0.0
March	744	100.0%	-6.0	-30.6	9.9	0.3	19.6	46.8	33.3	0.0	0.0
April	720	100.0%	4.2	-7.0	21.2	0.0	0.0	25.3	70.3	4.4	0.0
May	742	99.7%	9.9	-7.5	29.8	0.0	0.0	8.9	64.3	26.8	0.0
June	720	100.0%	14.8	3.0	26.5	0.0	0.0	0.0	53.8	46.3	0.0
July	739	99.3%	16.6	5.8	30.2	0.0	0.0	0.0	39.6	60.1	0.3
August	744	100.0%	14.7	3.5	29.1	0.0	0.0	0.0	50.5	49.5	0.0
September	720	100.0%	11.1	-1.0	26.0	0.0	0.0	0.6	74.9	24.6	0.0
October	744	100.0%	1.1	-17.2	18.0	0.0	0.5	37.4	61.4	0.7	0.0
November	720	100.0%	-4.8	-23.2	9.7	0.0	8.2	67.6	24.2	0.0	0.0
December	739	99.3%	-12.2	-28.4	4.7	0.0	32.7	65.8	1.5	0.0	0.0
Annual	8743	99.8%	1.1	-42.7	30.2	2.1	13.6	26.5	39.9	17.8	0.0

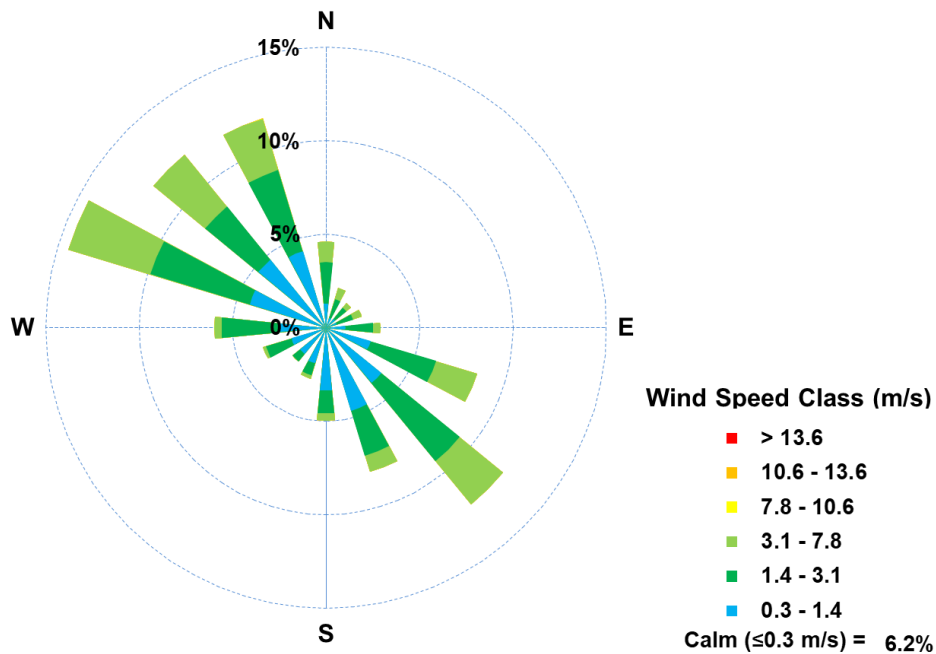
Table C-10. Maidstone Station: Summary of airpointer® relative humidity monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average RH (%)	Minimum 1-Hr RH (%)	Maximum 1-Hr RH (%)	Percent of Data in each Relative Humidity Range					
						≤15	15 - 30	30 - 60	60 - 80	80 - 90	>90
January	739	99.3%	68	34	84	3.0	0.0	5.9	83.9	7.2	0.0
February	671	99.9%	64	50	75	0.0	0.0	18.6	81.4	0.0	0.0
March	744	100.0%	64	37	86	0.0	0.0	35.3	59.5	5.1	0.0
April	720	100.0%	54	14	87	0.6	17.6	39.4	32.4	10.0	0.0
May	740	99.5%	50	14	85	0.8	19.9	44.6	27.3	7.4	0.0
June	720	100.0%	66	18	90	0.0	3.2	33.9	31.5	31.1	0.3
July	739	99.3%	71	37	90	0.0	0.0	27.9	34.2	36.0	1.9
August	744	100.0%	70	33	91	0.0	0.0	31.3	32.4	34.9	1.3
September	720	100.0%	71	28	90	0.0	0.6	26.8	31.8	40.1	0.7
October	744	100.0%	67	28	87	0.0	0.8	25.4	55.5	18.3	0.0
November	720	100.0%	72	43	86	0.0	0.0	7.4	77.8	14.9	0.0
December	739	99.3%	71	50	84	0.0	0.0	6.2	83.5	10.3	0.0
Annual	8740	99.8%	66	14	91	0.4	3.5	25.2	52.5	18.0	0.4

Table C-11. Maidstone Station: Wind frequency table for 2019

Wind Direction Sector	Percent of Data within Wind Speed Range, wind speed unit m/s						Totals
	0.3 - 1.4	1.4 - 3.1	3.1 - 7.8	7.8 - 10.6	10.6 - 13.6	>13.6	
North NorthEast	0.5%	1.1%	0.6%	0.0%	0.0%	0.0%	2.1%
NorthEast	0.5%	0.8%	0.3%	0.0%	0.0%	0.0%	1.6%
East NorthEast	0.5%	0.9%	0.5%	0.0%	0.0%	0.0%	1.9%
East	0.9%	1.5%	0.4%	0.0%	0.0%	0.0%	2.7%
East SouthEast	2.3%	3.6%	2.3%	0.0%	0.0%	0.0%	8.3%
SouthEast	3.6%	5.4%	3.0%	0.0%	0.0%	0.0%	11.9%
South SouthEast	4.0%	2.5%	0.9%	0.0%	0.0%	0.0%	7.4%
South	2.7%	1.2%	0.4%	0.0%	0.0%	0.0%	4.3%
South SouthWest	1.4%	0.7%	0.2%	0.0%	0.0%	0.0%	2.3%
SouthWest	1.1%	0.5%	0.0%	0.0%	0.0%	0.0%	1.7%
West SouthWest	1.5%	1.4%	0.1%	0.0%	0.0%	0.0%	3.0%
West	1.8%	3.1%	0.4%	0.0%	0.0%	0.0%	5.3%
West NorthWest	3.5%	5.5%	4.6%	0.0%	0.0%	0.0%	13.6%
NorthWest	4.2%	3.7%	3.6%	0.0%	0.0%	0.0%	11.4%
North NorthWest	4.0%	4.5%	2.9%	0.0%	0.0%	0.0%	11.4%
North	1.2%	2.2%	1.1%	0.0%	0.0%	0.0%	4.5%
Total	33.6%	38.7%	21.3%	0.0%	0.0%	0.0%	93.6%

Percent Calm (≤ 0.3 m/s)	6.4%
Number of Valid Hourly-Average Data	8731
Total Workable Hours in Time Period	8757



APPENDIX D. CLAVET STATION: CONTINUOUS MONITORING DATA

Table D-1 Clavet Station: Summary statistics for continuous air monitoring results for 2019

Parameter	Unit	Calibration & AIC ^a (hours)	Valid Data (hours)	Uptime (%)	Summary Statistics for Hourly Average Data		
					Average	Minimum	Maximum
NO	ppb	408	8336	100.0%	2.2	< 0.1	53.7
NO ₂	ppb	408	8336	100.0%	6.2	< 0.1	43.6
NO _x	ppb	408	8336	100.0%	8.4	< 0.1	93.2
O ₃	ppb	408	8337	100.0%	26	< 1	85
PM _{2.5}	µg/m ³	0	8635	99.9%	6	< 1	78
Precipitation	mm	0	8744	100.00%	218.9 ^b	< 0.1	20.4
Ambient Temperature	°C	0	8746	100.0%	2.2	-39.4	34.0
Relative Humidity	%	0	8744	100.0%	68	< 1	90
Wind Speed	m/s	0	8733	100.0%	1.9	Calm	7.4

a. Automatic Instrument Check

b. Total precipitation

Table D-2. Clavet Station: Summary of airpointer® NO monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
January	705	99.6%	1.4	19.5	-	4.1	-	96.0	3.8	0.1	0.0	0.0	0.0
February	643	100.0%	3.2	53.7	-	17.1	-	84.0	12.4	3.4	0.2	0.0	0.0
March	705	100.0%	1.3	13.2	-	2.3	-	97.9	2.1	0.0	0.0	0.0	0.0
April	689	100.0%	0.6	12.4	-	1.3	-	99.7	0.3	0.0	0.0	0.0	0.0
May	707	100.0%	0.6	8.0	-	0.9	-	99.6	0.4	0.0	0.0	0.0	0.0
June	680	100.0%	0.6	9.1	-	1.7	-	99.4	0.6	0.0	0.0	0.0	0.0
July	712	100.0%	0.5	7.6	-	1.1	-	99.4	0.6	0.0	0.0	0.0	0.0
August	708	100.0%	0.6	10.1	-	1.4	-	99.3	0.7	0.0	0.0	0.0	0.0
September	682	100.0%	0.6	4.8	-	1.5	-	100.0	0.0	0.0	0.0	0.0	0.0
October	712	100.0%	1.2	22.6	-	3.4	-	97.2	2.5	0.3	0.0	0.0	0.0
November	689	100.0%	1.2	8.3	-	2.8	-	98.4	1.6	0.0	0.0	0.0	0.0
December	704	100.0%	1.3	17.9	-	3.0	-	98.0	1.8	0.1	0.0	0.0	0.0
Annual ^c	8336	100.0%	2.2	53.7	-	17.1	-	97.5	2.2	0.3	0.0	0.0	0.0

- a. No 1-hour Saskatchewan Ambient Air Quality Standard
- b. No 24-hour Saskatchewan Ambient Air Quality Standard
- c. No annual Saskatchewan Ambient Air Quality Standard

Table D-3. Clavet Station: Summary of airpointer® NO₂ monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
January	705	99.6%	4.7	23.0	0	10.9	-	65.8	32.2	1.9	0.0	0.0	0.0
February	643	100.0%	7.8	43.6	0	27.2	-	46.2	39.3	14.5	0.0	0.0	0.0
March	705	100.0%	5.2	20.9	0	9.1	-	53.2	45.4	1.4	0.0	0.0	0.0
April	689	100.0%	2.7	23.2	0	4.9	-	87.5	12.2	0.3	0.0	0.0	0.0
May	707	100.0%	3.2	17.1	0	6.3	-	81.0	18.5	0.4	0.0	0.0	0.0
June	680	100.0%	3.5	16.8	0	6.9	-	78.7	21.0	0.3	0.0	0.0	0.0
July	712	100.0%	1.8	8.9	0	2.8	-	96.5	3.5	0.0	0.0	0.0	0.0
August	708	100.0%	1.8	9.9	0	3.3	-	95.3	4.7	0.0	0.0	0.0	0.0
September	682	100.0%	1.7	10.7	0	3.1	-	95.9	4.1	0.0	0.0	0.0	0.0
October	712	100.0%	2.9	20.8	0	7.4	-	87.4	11.9	0.7	0.0	0.0	0.0
November	689	100.0%	3.3	14.9	0	7.1	-	82.9	17.1	0.0	0.0	0.0	0.0
December	704	100.0%	4.6	18.7	0	7.6	-	66.6	32.7	0.7	0.0	0.0	0.0
Annual ^c	8336	100.0%	6.2	43.6	0	27.2	-	78.2	20.2	1.6	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 212 ppb

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. Annual Saskatchewan Ambient Air Quality Standard = 53 ppb

Table D-4. Clavet Station: Summary of airpointer® NOx monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
January	705	99.6%	6.1	33.6	-	15.0	-	52.1	41.2	6.7	0.0	0.0	0.0
February	643	100.0%	11.0	93.2	-	44.3	-	34.4	43.2	21.6	0.8	0.0	0.0
March	705	100.0%	6.5	25.5	-	11.2	-	37.9	58.6	3.5	0.0	0.0	0.0
April	689	100.0%	3.3	26.6	-	5.4	-	81.1	18.0	0.9	0.0	0.0	0.0
May	707	100.0%	3.7	21.3	-	7.2	-	77.1	21.6	1.3	0.0	0.0	0.0
June	680	100.0%	4.1	20.0	-	7.9	-	72.4	26.8	0.9	0.0	0.0	0.0
July	712	100.0%	2.3	13.7	-	3.7	-	93.3	6.7	0.0	0.0	0.0	0.0
August	708	100.0%	2.4	13.6	-	4.4	-	89.4	10.6	0.0	0.0	0.0	0.0
September	682	100.0%	2.3	13.3	-	4.4	-	90.5	9.5	0.0	0.0	0.0	0.0
October	712	100.0%	4.1	41.0	-	9.5	-	72.9	25.0	2.1	0.0	0.0	0.0
November	689	100.0%	4.4	20.0	-	9.9	-	69.5	28.7	1.7	0.0	0.0	0.0
December	704	100.0%	5.9	33.2	-	10.6	-	48.2	49.1	2.7	0.0	0.0	0.0
Annual ^c	8336	100.0%	8.4	93.2	-	44.3	-	68.4	28.2	3.3	0.1	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

Table D-5. Clavet Station: Summary of airpointer® O₃ monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 8-Hr Conc. (ppb)	8-Hour Conc. Above CWS ^b (no.)	Percent of Data in each Concentration Range					
								≤10	10 - 20	20 - 40	40 - 65	65 - 82	>82
January	705	99.6%	25	38	0	37	0	5.3	13.2	81.5	0.0	0.0	0.0
February	643	100.0%	27	39	0	38	0	1.7	14.9	83.4	0.0	0.0	0.0
March	705	100.0%	40	68	0	62	0	0.3	3.0	47.0	48.7	1.1	0.0
April	689	100.0%	42	69	0	67	4	0.0	4.6	38.0	56.5	0.9	0.0
May	708	100.0%	40	85	1	77	20	0.7	7.6	40.0	47.3	4.2	0.1
June	680	100.0%	35	82	0	76	16	1.2	14.6	48.5	32.4	3.4	0.0
July	712	100.0%	24	46	0	44	0	9.3	30.3	55.3	5.1	0.0	0.0
August	708	100.0%	20	47	0	44	0	14.8	36.4	47.0	1.7	0.0	0.0
September	682	100.0%	17	41	0	36	0	22.6	41.9	35.3	0.1	0.0	0.0
October	712	100.0%	18	36	0	32	0	16.9	46.8	36.4	0.0	0.0	0.0
November	689	100.0%	19	33	0	30	0	10.7	39.8	49.5	0.0	0.0	0.0
December	704	100.0%	21	34	0	31	0	4.0	36.9	59.1	0.0	0.0	0.0
Annual ^c	8337	100.0%	26	85	1	77	40	7.3	24.2	51.7	16.0	0.8	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 82 ppb

b. 8-hour Canada-Wide Standard = 65 ppb

c. No annual Saskatchewan Ambient Air Quality Standard

Table D-6. Clavet Station: Summary of airpointer® PM_{2.5} monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (µg/m ³)	Maximum 1-Hr Conc. (µg/m ³)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (µg/m ³)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 10	10 - 15	15 - 30	30 - 80	>80
January	736	99.6%	6	27	-	18	0	54.2	28.7	12.8	4.3	0.0	0.0
February	672	100.0%	7	73	-	22	0	46.1	35.0	12.1	6.1	0.7	0.0
March	739	99.3%	6	53	-	17	0	62.2	24.4	6.6	5.5	1.2	0.0
April	720	100.0%	6	52	-	11	0	54.9	34.0	6.9	2.8	1.4	0.0
May	742	100.0%	7	34	-	18	0	40.7	34.6	15.6	8.4	0.7	0.0
June	718	100.0%	7	48	-	18	0	45.1	35.7	14.1	4.0	1.1	0.0
July	744	100.0%	5	15	-	10	0	51.7	41.5	6.5	0.3	0.0	0.0
August	636	100.0%	5	40	-	10	0	56.8	37.1	4.1	1.7	0.3	0.0
September	720	100.0%	4	33	-	12	0	72.6	20.3	3.6	3.1	0.4	0.0
October	744	100.0%	4	28	-	9	0	67.2	25.3	5.2	2.3	0.0	0.0
November	720	100.0%	5	29	-	13	0	69.7	19.0	7.2	4.0	0.0	0.0
December	744	100.0%	6	78	-	12	0	53.8	27.0	13.0	5.6	0.5	0.0
Annual ^c	8635	99.9%	6	78	-	22	0	56.3	30.1	9.0	4.0	0.5	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24-hour Canada-Wide Standard = 28 µg/m³

c. No annual Saskatchewan Ambient Air Quality Standard

Table D-7. Clavet Station: Summary of airpointer® precipitation monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Total Precip. (mm)	Maximum 1-Hr Precip. (mm)	Maximum 24-Hr Precip. (mm)	Percent of Data in each Precipitation Range					
						≤5	5 - 10	10 - 25	25 - 50	50 - 75	>75
January	736	99.6%	1.9	0.8	1.1	100.0	0.0	0.0	0.0	0.0	100.0
February	672	100.0%	0.1	< 0.1	0.1	100.0	0.0	0.0	0.0	0.0	100.0
March	744	100.0%	0.1	0.1	0.1	100.0	0.0	0.0	0.0	0.0	100.0
April	720	100.0%	5.6	2.5	4.2	100.0	0.0	0.0	0.0	0.0	100.0
May	742	100.0%	10.3	2.1	5.0	100.0	0.0	0.0	0.0	0.0	100.0
June	718	100.0%	74.3	6.0	21.3	99.7	0.3	0.0	0.0	0.0	99.7
July	744	100.0%	51.5	8.3	13.4	99.7	0.3	0.0	0.0	0.0	99.7
August	740	100.0%	39.8	20.4	23.1	99.7	0.1	0.1	0.0	0.0	99.7
September	720	100.0%	33.6	12.8	18.7	99.9	0.0	0.1	0.0	0.0	99.9
October	744	100.0%	1.2	0.7	0.7	100.0	0.0	0.0	0.0	0.0	100.0
November	720	100.0%	0.5	0.2	0.3	100.0	0.0	0.0	0.0	0.0	100.0
December	744	100.0%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	100.0
Annual	8744	100.0%	218.9	20.4	23.1	100.0	0.0	0.0	0.0	0.0	100.0

Table D-8. Clavet Station: Summary of airpointer® ambient temperature monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Temp. (°C)	Minimum 1-Hr Temp. (°C)	Maximum 1-Hr Temp. (°C)	Percent of Data in each Temperature Range					
						≤-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
January	736	99.6%	-12.7	-30.2	4.0	0.1	39.2	56.6	4.1	0.0	0.0
February	672	100.0%	-22.9	-39.4	-6.2	16.2	71.3	12.5	0.0	0.0	0.0
March	744	100.0%	-4.9	-31.1	14.4	0.5	15.7	47.6	36.2	0.0	0.0
April	720	100.0%	5.5	-8.0	20.7	0.0	0.0	21.1	71.3	7.6	0.0
May	742	100.0%	10.5	-8.8	31.4	0.0	0.0	7.8	65.4	26.3	0.5
June	720	100.0%	16.4	5.0	33.5	0.0	0.0	0.0	43.8	54.6	1.7
July	744	100.0%	18.6	5.8	31.5	0.0	0.0	0.0	25.5	73.9	0.5
August	740	100.0%	16.4	3.7	34.0	0.0	0.0	0.0	43.6	55.3	1.1
September	720	100.0%	12.4	0.0	30.6	0.0	0.0	0.1	68.9	30.6	0.4
October	744	100.0%	1.6	-17.6	19.1	0.0	0.8	33.9	63.4	1.9	0.0
November	720	100.0%	-4.8	-22.4	10.2	0.0	5.8	71.5	22.6	0.0	0.0
December	744	100.0%	-11.2	-29.9	3.3	0.0	25.1	72.8	2.0	0.0	0.0
Annual	8746	100.0%	2.2	-39.4	34.0	1.3	12.9	27.2	37.3	20.9	0.4

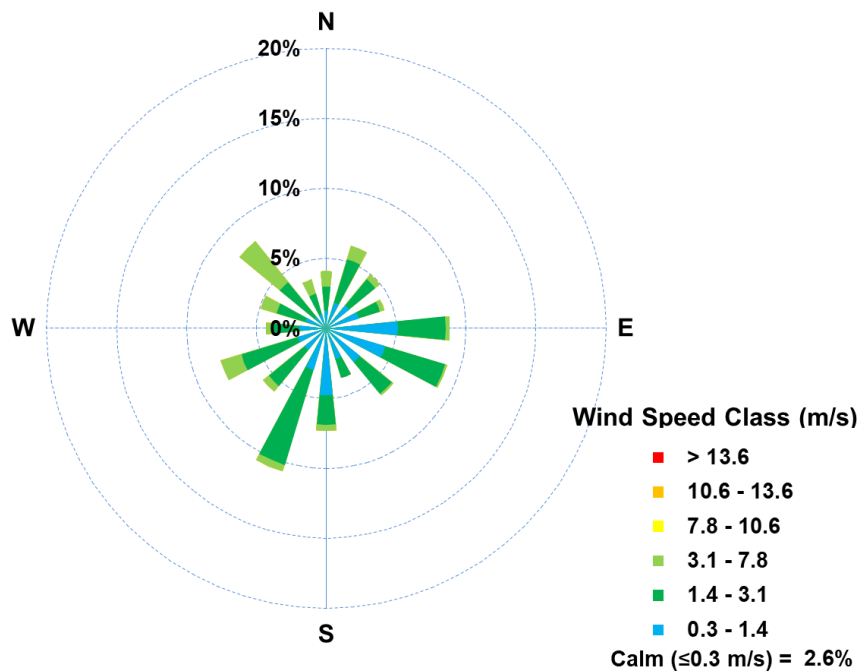
Table D-9. Clavet Station: Summary of airpointer® relative humidity monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average RH (%)	Minimum 1-Hr RH (%)	Maximum 1-Hr RH (%)	Percent of Data in each Relative Humidity Range					
						≤15	15 - 30	30 - 60	60 - 80	80 - 90	>90
January	736	99.6%	67	40	85	3.2	0.0	7.0	87.9	2.0	0.0
February	672	100.0%	65	52	77	0.0	0.0	14.0	86.0	0.0	0.0
March	744	100.0%	64	34	87	0.0	0.0	32.8	61.7	5.5	0.0
April	720	100.0%	50	14	89	0.7	20.6	43.5	25.8	9.4	0.0
May	742	100.0%	46	13	86	1.8	27.8	41.4	25.1	4.0	0.0
June	718	100.0%	57	12	90	0.3	11.8	40.1	28.7	19.1	0.0
July	744	100.0%	64	25	90	0.0	0.4	40.1	37.4	22.2	0.0
August	740	100.0%	62	27	89	0.0	1.4	42.3	39.2	17.2	0.0
September	720	100.0%	69	26	90	0.1	0.8	28.1	36.3	34.7	0.0
October	744	100.0%	65	23	85	0.0	1.3	30.2	57.7	10.8	0.0
November	720	100.0%	72	41	86	0.0	0.0	7.4	80.6	12.1	0.0
December	744	100.0%	71	52	83	0.0	0.0	3.1	87.2	9.7	0.0
Annual	8744	100.0%	68	26	90	0.5	5.3	27.5	54.4	12.2	0.0

Table D-10 Clavet Station: Wind frequency table for 2019

Wind Direction Sector	Percent of Data within Wind Speed Range, wind speed unit m/s						Totals
	0.3 - 1.4	1.4 - 3.1	3.1 - 7.8	7.8 - 10.6	10.6 - 13.6	>13.6	
North NorthEast	1.8%	3.2%	1.0%	0.0%	0.0%	0.0%	6.0%
NorthEast	2.0%	2.4%	0.4%	0.0%	0.0%	0.0%	4.8%
East NorthEast	2.3%	1.6%	0.3%	0.0%	0.0%	0.0%	4.2%
East	4.7%	3.4%	0.3%	0.0%	0.0%	0.0%	8.4%
East SouthEast	4.0%	4.5%	0.2%	0.0%	0.0%	0.0%	8.6%
SouthEast	2.8%	2.9%	0.2%	0.0%	0.0%	0.0%	5.9%
South SouthEast	2.0%	1.4%	0.0%	0.0%	0.0%	0.0%	3.4%
South	4.6%	2.1%	0.4%	0.0%	0.0%	0.0%	7.1%
South SouthWest	3.0%	7.1%	0.5%	0.0%	0.0%	0.0%	10.6%
SouthWest	1.9%	3.3%	0.5%	0.0%	0.0%	0.0%	5.8%
West SouthWest	2.0%	4.2%	1.5%	0.0%	0.0%	0.0%	7.8%
West	1.8%	2.0%	0.4%	0.0%	0.0%	0.0%	4.2%
West NorthWest	1.5%	2.1%	1.2%	0.0%	0.0%	0.0%	4.8%
NorthWest	1.0%	3.2%	3.7%	0.0%	0.0%	0.0%	8.0%
North NorthWest	1.0%	1.5%	1.1%	0.0%	0.0%	0.0%	3.6%
North	1.1%	1.7%	1.1%	0.0%	0.0%	0.0%	4.0%
Total	37.5%	46.7%	12.8%	0.0%	0.0%	0.0%	97.1%

Percent Calm (<0.3 m/s)	2.9%
Number of Valid Hourly-Average Data	8733
Total Workable Hours in Time Period	8736



APPENDIX E. KERROBERT STATION: CONTINUOUS MONITORING DATA

Table E-1 Kerrobert Station: Summary statistics for continuous air monitoring results for 2019

Parameter	Unit	Calibration & AIC ^a (hours)	Valid Data (hours)	Uptime (%)	Summary Statistics for Hourly Average Data		
					Average	Minimum	Maximum
SO ₂	ppb	384	8142	97.2%	0.2	< 0.1	3.6
H ₂ S	ppb	384	8142	97.2%	0.2	< 0.1	6.4
PM _{2.5}	µg/m ³	0	8516	97.2%	5	< 1	72
Precipitation	mm	0	8374	96.7%	329.2 ^b	< 0.1	31.7
Ambient Temperature	°C	0	8374	96.7%	1.5	-36.0	34.6
Relative Humidity	%	0	8374	96.7%	65	< 1	91
Wind Speed	m/s	0	8564	96.5%	2.6	Calm	13.5

a. *Automatic Instrument Check*

b. *Total precipitation*

Table E-2. Kerrobert Station: Summary of airpointer® SO₂ monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤1	1 - 5	5 - 11	11 - 57	57 - 172	>172
January	708	99.2%	0.1	2.1	0	0.5	0	99.3	0.7	0.0	0.0	0.0	0.0
February	643	99.8%	0.8	3.6	0	2.5	0	71.4	28.6	0.0	0.0	0.0	0.0
March	648	91.4%	0.4	3.2	0	1.3	0	87.0	13.0	0.0	0.0	0.0	0.0
April	674	97.4%	0.1	1.1	0	0.2	0	99.9	0.1	0.0	0.0	0.0	0.0
May	569	79.4%	0.1	1.2	0	0.2	0	99.8	0.2	0.0	0.0	0.0	0.0
June	683	100.0%	< 0.1	1.1	0	0.1	0	99.6	0.4	0.0	0.0	0.0	0.0
July	712	100.0%	0.1	0.6	0	0.2	0	100.0	0.0	0.0	0.0	0.0	0.0
August	711	100.0%	0.1	0.9	0	0.2	0	100.0	0.0	0.0	0.0	0.0	0.0
September	685	100.0%	0.1	1.7	0	0.3	0	99.9	0.1	0.0	0.0	0.0	0.0
October	712	100.0%	0.1	1.8	0	0.2	0	99.7	0.3	0.0	0.0	0.0	0.0
November	689	100.0%	< 0.1	0.4	0	0.2	0	100.0	0.0	0.0	0.0	0.0	0.0
December	708	100.0%	0.1	0.9	0	0.3	0	100.0	0.0	0.0	0.0	0.0	0.0
Annual ^c	8142	97.2%	0.2	3.6	0	2.5	0	96.6	3.4	0.0	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 172 ppb

b. 24-hour Saskatchewan Ambient Air Quality Standard = 57 ppb

c. Annual Saskatchewan Ambient Air Quality Standard = 11 ppb

Table E-3. Kerrobert Station: Summary of airpointer® H₂S monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤1	1 - 3.6	3.6 - 5	5 - 8	8 - 10.8	>10.8
January	708	99.2%	0.1	1.0	0	0.4	0	99.9	0.1	0.0	0.0	0.0	0.0
February	643	99.8%	0.1	1.0	0	0.3	0	100.0	0.0	0.0	0.0	0.0	0.0
March	648	91.4%	0.1	1.2	0	0.4	0	98.8	1.2	0.0	0.0	0.0	0.0
April	674	97.4%	0.1	1.9	0	0.2	0	99.9	0.1	0.0	0.0	0.0	0.0
May	569	79.4%	0.1	2.5	0	0.5	0	99.3	0.7	0.0	0.0	0.0	0.0
June	683	100.0%	0.3	2.9	0	0.5	0	97.4	2.6	0.0	0.0	0.0	0.0
July	712	100.0%	0.3	2.6	0	0.6	0	96.2	3.8	0.0	0.0	0.0	0.0
August	711	100.0%	0.4	5.6	0	1.1	0	93.2	6.3	0.1	0.3	0.0	0.0
September	685	100.0%	0.3	6.4	0	0.9	0	96.2	3.6	0.0	0.1	0.0	0.0
October	712	100.0%	0.1	2.6	0	0.5	0	99.7	0.3	0.0	0.0	0.0	0.0
November	689	100.0%	0.1	0.5	0	0.3	0	100.0	0.0	0.0	0.0	0.0	0.0
December	708	100.0%	0.1	0.8	0	0.3	0	100.0	0.0	0.0	0.0	0.0	0.0
Annual	8142	97.2%	0.2	6.4	0	1.1	0	98.3	1.6	0.0	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 10.8 ppb

b. 24-hour Saskatchewan Ambient Air Quality Standard = 3.6 ppb

c. No annual Saskatchewan Ambient Air Quality Standard

Table E-4. Kerrobert Station: Summary of airpointer® PM_{2.5} monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (µg/m ³)	Maximum 1-Hr Conc. (µg/m ³)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (µg/m ³)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 10	10 - 15	15 - 30	30 - 80	>80
January	736	99.0%	5	28	-	14	0	70.9	18.7	6.7	3.7	0.0	0.0
February	672	100.0%	6	24	-	11	0	53.9	31.8	12.4	1.9	0.0	0.0
March	679	91.3%	5	29	-	9	0	61.1	27.1	7.7	4.1	0.0	0.0
April	702	97.5%	4	22	-	8	0	72.2	24.2	3.3	0.3	0.0	0.0
May	596	80.1%	6	57	-	15	0	55.4	30.7	8.6	3.7	1.7	0.0
June	716	99.4%	7	72	-	25	0	53.6	25.7	10.1	7.1	3.5	0.0
July	744	100.0%	6	42	-	20	0	50.3	37.2	7.1	4.3	1.1	0.0
August	744	100.0%	6	25	-	10	0	49.1	41.5	7.8	1.6	0.0	0.0
September	719	99.9%	4	16	-	7	0	72.9	25.7	1.1	0.3	0.0	0.0
October	744	100.0%	3	11	-	5	0	89.2	10.5	0.3	0.0	0.0	0.0
November	720	100.0%	4	32	-	12	0	72.1	18.6	7.4	1.8	0.1	0.0
December	744	100.0%	6	32	-	15	0	57.5	28.1	10.2	3.9	0.3	0.0
Annual	8516	97.2%	5	72	-	25	0	63.4	26.6	6.8	2.7	0.5	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24-hour Canada-Wide Standard = 28 µg/m³

c. No annual Saskatchewan Ambient Air Quality Standard

Table E-5. Kerrobert Station: Summary of airpointer® precipitation monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Total Precip. (mm)	Maximum 1-Hr Precip. (mm)	Maximum 24-Hr Precip. (mm)	Percent of Data in each Precipitation Range					
						≤5	5 - 10	10 - 25	25 - 50	50 - 75	>75
January	738	99.2%	0.5	0.2	0.2	100.0	0.0	0.0	0.0	0.0	0.0
February	672	100.0%	0.3	0.1	0.1	100.0	0.0	0.0	0.0	0.0	0.0
March	683	91.8%	1.9	1.7	1.8	100.0	0.0	0.0	0.0	0.0	0.0
April	702	97.5%	3.4	2.3	2.3	100.0	0.0	0.0	0.0	0.0	0.0
May	541	72.7%	5.8	2.0	2.0	100.0	0.0	0.0	0.0	0.0	0.0
June	622	100.0%	142.6	31.7	95.5	98.7	0.6	0.5	0.2	0.0	0.0
July	744	100.0%	83.2	17.0	17.4	99.6	0.1	0.3	0.0	0.0	0.0
August	744	100.0%	20.1	4.2	10.2	100.0	0.0	0.0	0.0	0.0	0.0
September	720	100.0%	64.8	19.0	26.2	99.6	0.1	0.3	0.0	0.0	0.0
October	744	100.0%	0.3	0.2	0.2	100.0	0.0	0.0	0.0	0.0	0.0
November	720	100.0%	6.4	2.6	3.5	100.0	0.0	0.0	0.0	0.0	0.0
December	744	100.0%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
Annual	8374	96.7%	329.2	31.7	95.5	99.8	0.1	0.1	0.0	0.0	0.0

Table E-6. Kerrobert Station: Summary of airpointer® ambient temperature monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Temp. (°C)	Minimum 1-Hr Temp. (°C)	Maximum 1-Hr Temp. (°C)	Percent of Data in each Temperature Range					
						≤-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
January	738	99.2%	-10.4	-26.2	4.3	0.0	34.4	58.5	7.1	0.0	0.0
February	672	100.0%	-22.6	-36.0	-6.0	8.0	79.8	12.2	0.0	0.0	0.0
March	683	91.8%	-6.5	-33.0	12.6	1.5	19.9	50.2	28.4	0.0	0.0
April	702	97.5%	5.0	-6.0	21.5	0.0	0.0	21.5	74.6	3.8	0.0
May	541	72.7%	8.2	-7.2	23.9	0.0	0.0	11.6	73.4	15.0	0.0
June	622	100.0%	15.0	3.0	29.1	0.0	0.0	0.0	53.1	46.9	0.0
July	744	100.0%	17.2	6.6	31.2	0.0	0.0	0.0	39.7	59.9	0.4
August	744	100.0%	15.7	4.8	34.6	0.0	0.0	0.0	47.3	51.9	0.8
September	720	100.0%	11.5	-0.7	27.0	0.0	0.0	4.6	68.2	27.2	0.0
October	744	100.0%	1.3	-15.4	19.4	0.0	0.5	40.7	56.2	2.6	0.0
November	720	100.0%	-4.4	-24.1	9.8	0.0	8.1	65.3	26.7	0.0	0.0
December	744	100.0%	-9.7	-24.7	3.5	0.0	17.9	80.2	1.9	0.0	0.0
Annual	8374	96.7%	1.5	-36.0	34.6	0.8	13.4	29.6	38.8	17.2	0.1

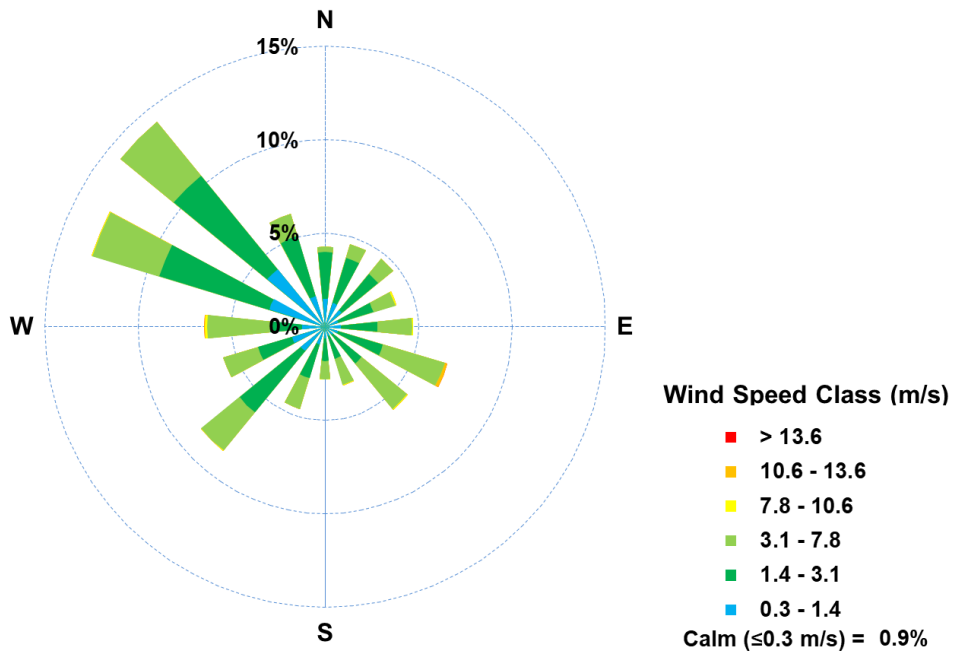
Table E-7. Kerrobert Station: Summary of airpointer® relative humidity monitoring results for 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average RH (%)	Minimum 1-Hr RH (%)	Maximum 1-Hr RH (%)	Percent of Data in each Relative Humidity Range					
						≤15	15 - 30	30 - 60	60 - 80	80 - 90	>90
January	738	99.2%	71	43	85	3.0	0.0	4.5	80.7	11.8	0.0
February	672	100.0%	69	57	81	0.0	0.0	3.1	96.4	0.4	0.0
March	683	91.8%	68	35	87	0.0	0.0	14.8	77.7	7.5	0.0
April	702	97.5%	50	17	88	0.0	20.4	45.3	26.1	8.3	0.0
May	541	72.7%	45	18	85	0.0	25.3	54.0	18.1	2.6	0.0
June	622	100.0%	61	18	90	0.0	7.9	36.7	33.8	21.7	0.0
July	744	100.0%	68	26	90	0.0	1.1	31.3	37.4	29.8	0.4
August	744	100.0%	61	16	91	0.0	5.1	40.1	35.2	19.1	0.5
September	720	100.0%	68	24	90	0.0	1.0	29.3	35.6	33.3	0.8
October	744	100.0%	64	26	88	0.1	1.9	30.2	54.4	13.3	0.0
November	720	100.0%	74	42	87	0.0	0.0	5.6	67.2	27.2	0.0
December	744	100.0%	74	50	85	0.0	0.0	1.5	79.8	18.7	0.0
Annual	8374	96.7%	65	16	91	0.3	4.7	24.0	54.3	16.5	0.2

Table E-8 Kerrobert Station: Wind frequency table for the year 2019

Wind Direction Sector	Percent of Data within Wind Speed Range, wind speed unit m/s						Totals
	0.3 - 1.4	1.4 - 3.1	3.1 - 7.8	7.8 - 10.6	10.6 - 13.6	>13.6	
North NorthEast	1.3%	2.5%	0.8%	0.0%	0.0%	0.0%	4.6%
NorthEast	1.1%	2.5%	1.0%	0.0%	0.0%	0.0%	4.6%
East NorthEast	0.7%	1.9%	1.2%	0.1%	0.0%	0.0%	4.0%
East	0.8%	2.0%	1.8%	0.1%	0.0%	0.0%	4.7%
East SouthEast	0.7%	2.5%	3.4%	0.1%	0.0%	0.0%	6.8%
SouthEast	0.5%	2.0%	3.1%	0.0%	0.0%	0.0%	5.6%
South SouthEast	0.5%	1.3%	1.4%	0.1%	0.0%	0.0%	3.3%
South	0.6%	1.2%	1.0%	0.0%	0.0%	0.0%	2.8%
South SouthWest	0.9%	1.9%	1.7%	0.0%	0.0%	0.0%	4.5%
SouthWest	1.6%	4.2%	2.6%	0.0%	0.0%	0.0%	8.5%
West SouthWest	1.8%	1.9%	1.9%	0.0%	0.0%	0.0%	5.6%
West	1.1%	1.7%	3.4%	0.1%	0.1%	0.0%	6.4%
West NorthWest	3.0%	6.1%	3.7%	0.0%	0.0%	0.0%	12.9%
NorthWest	3.9%	6.5%	3.7%	0.0%	0.0%	0.0%	14.0%
North NorthWest	1.7%	3.4%	1.2%	0.0%	0.0%	0.0%	6.3%
North	1.4%	2.5%	0.3%	0.0%	0.0%	0.0%	4.2%
Total	21.6%	44.1%	32.5%	0.6%	0.1%	0.0%	98.8%

Percent Calm (≤ 0.3 m/s)	1.2%
Number of Valid Hourly-Average Data	8361
Total Workable Hours in Time Period	8564



APPENDIX F. MEADOW LAKE CITY STATION: CONTINUOUS MONITORING DATA

Table F-1 Meadow Lake City Station: Summary statistics for continuous air monitoring results for November 28 to December 31, 2019

Parameter	Unit	Calibration & AIC ^a (hours)	Valid Data (hours)	Uptime (%)	Summary Statistics for Hourly Average Data		
					Average	Minimum	Maximum
NO	ppb	42	764	100.0%	0.9	< 0.1	48.2
NO ₂	ppb	42	765	100.0%	3.2	< 0.1	35.1
NO _x	ppb	42	765	100.0%	4.1	< 0.1	82.2
O ₃	ppb	42	764	100.0%	23	< 1	39
PM _{2.5}	µg/m ³	0	806	100.0%	6	< 1	78
Precipitation	mm	0	806	100.0%	< 0.1 ^b	< 0.1	< 0.1
Ambient Temperature	°C	0	806	100.0%	-1.0	-29.7	4.8
Relative Humidity	%	0	806	100.0%	69	< 1	82
Wind Speed	m/s	0	806	100.0%	0.8	Calm	3.3

a. *Automatic Instrument Check*

b. *Total precipitation*

Table F-2. Meadow Lake City Station: Summary of airpointer® NO monitoring results for November 28 to December 31, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
November	53	100.0%	0.3	1.2	-	0.5	-	100.0	0.0	0.0	0.0	0.0	0.0
December	711	100.0%	1.5	48.2	-	7.1	-	95.9	2.3	1.8	0.0	0.0	0.0
Annual ^c	764	100.0%	0.9	48.2	-	7.1	-	96.2	2.1	1.7	0.0	0.0	0.0

- a. No 1-hour Saskatchewan Ambient Air Quality Standard
- b. No 24-hour Saskatchewan Ambient Air Quality Standard
- c. No annual Saskatchewan Ambient Air Quality Standard

Table F-3. Meadow Lake City Station: Summary of airpointer® NO₂ monitoring results for November 28 to December 31, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
November	53	100.0%	1.2	8.4	0	1.7	-	96.2	3.8	0.0	0.0	0.0	0.0
December	711	100.0%	5.2	35.1	0	12.3	-	61.9	33.3	4.8	0.0	0.0	0.0
Annual ^c	765	100.0%	0.4	35.1	0	12.3	-	64.2	31.4	4.4	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 212 ppb

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. Annual Saskatchewan Ambient Air Quality Standard = 53 ppb

Table F-4. Meadow Lake City Station: Summary of airpointer® NOx monitoring results for November 28 to December 31, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
November	53	100.0%	1.5	9.5	-	2.2	-	94.3	5.7	0.0	0.0	0.0	0.0
December	711	100.0%	6.7	82.2	-	17.2	-	53.4	39.1	6.9	0.6	0.0	0.0
Annual ^c	765	100.0%	0.6	82.2	-	17.2	-	56.2	36.9	6.4	0.5	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

Table F-5. Meadow Lake City Station: Summary of airpointer® O₃ monitoring results for November 28 to December 31, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 8-Hr Conc. (ppb)	8-Hour Conc. Above CWS ^b (no.)	Percent of Data in each Concentration Range					
								≤10	10 - 20	20 - 40	40 - 65	65 - 82	>82
November	53	100.0%	24	29	0	28	0	0.0	13.2	86.8	0.0	0.0	0.0
December	711	100.0%	21	39	0	37	0	7.7	31.1	61.2	0.0	0.0	0.0
Annual ^c	764	100.0%	23	39	0	37	0	7.2	29.8	63.0	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 82 ppb

b. 8-hour Canada-Wide Standard = 65 ppb

c. No annual Saskatchewan Ambient Air Quality Standard

Table F-6. Meadow Lake City Station: Summary of airpointer® PM_{2.5} monitoring results for November 28 to December 31, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (µg/m ³)	Maximum 1-Hr Conc. (µg/m ³)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (µg/m ³)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								≤5	5 - 10	10 - 15	15 - 30	30 - 80	>80
November	62	100.0%	4	22	-	5	0	87	8	2	3	0	0
December	744	100.0%	8	78	-	19	0	50	25	12	11	2	0
Annual ^c	806	100.0%	6	78	-	19	0	53.0	23.9	11.0	10.4	1.6	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24-hour Canada-Wide Standard = 28 µg/m³

c. No annual Saskatchewan Ambient Air Quality Standard

Table F-7. Meadow Lake City Station: Summary of airpointer® precipitation monitoring results for November 28 to December 31, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Total Precip. (mm)	Maximum 1-Hr Precip. (mm)	Maximum 24-Hr Precip. (mm)	Percent of Data in each Precipitation Range					
						≤5	5 - 10	10 - 25	25 - 50	50 - 75	>75
November	62	100.0%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
December	744	100.0%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
Annual	806	100.0%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0

Table F-8. Meadow Lake City Station: Summary of airpointer® ambient temperature monitoring results for November 28 to December 31, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Temp. (°C)	Minimum 1-Hr Temp. (°C)	Maximum 1-Hr Temp. (°C)	Percent of Data in each Temperature Range					
						≤-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
November	62	100.0%	-7.8	-12.8	-5.0	0.0	0.0	100.0	0.0	0.0	0.0
December	744	100.0%	-11.0	-29.7	4.8	0.0	28.1	69.8	2.2	0.0	0.0
Annual	806	100.0%	-9.4	-29.7	4.8	0.0	25.9	72.1	2.0	0.0	0.0

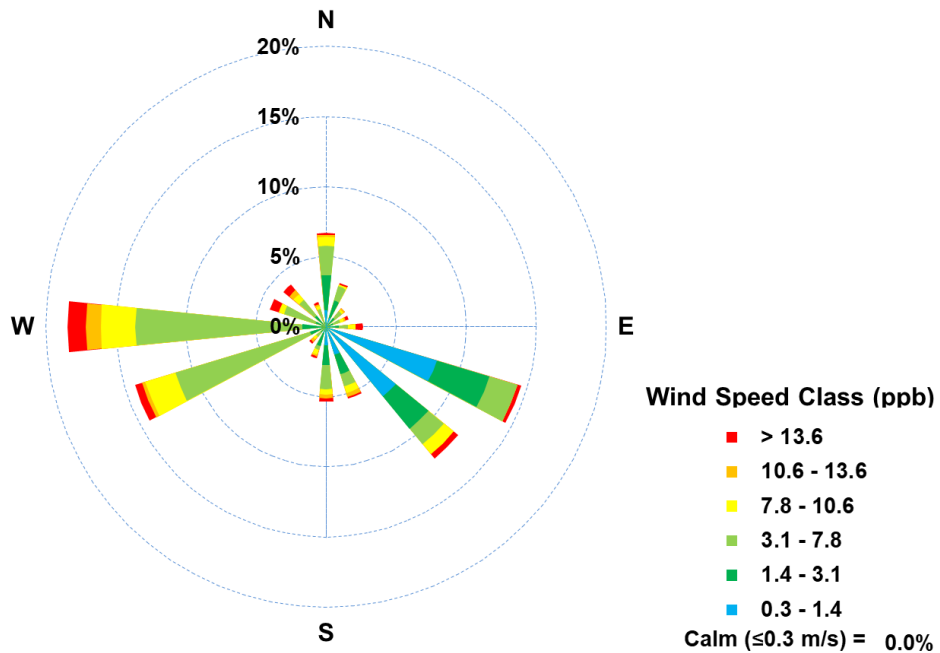
Table F-9. Meadow Lake City Station: Summary of airpointer® relative humidity monitoring results for November 28 to December 31, 2019

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average RH (%)	Minimum 1-Hr RH (%)	Maximum 1-Hr RH (%)	Percent of Data in each Relative Humidity Range					
						≤15	15 - 30	30 - 60	60 - 80	80 - 90	>90
November	62	100.0%	70	59	76	0.0	0.0	4.8	95.2	0.0	0.0
December	744	100.0%	67	48	82	0.0	0.0	15.5	83.5	1.1	0.0
Annual	806	100.0%	69	48	82	0.0	0.0	14.6	84.4	1.0	0.0

Table F-10 Meadow Lake City Station: Wind frequency table for November 28 to December 31, 2019

Wind Direction Sector	Percent of Data within Wind Speed Range, wind speed unit m/s						Totals
	0.3 - 1.4	1.4 - 3.1	3.1 - 7.8	7.8 - 10.6	10.6 - 13.6	>13.6	
North NorthEast	2.6%	0.1%	0.0%	0.0%	0.0%	0.0%	2.7%
NorthEast	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
East NorthEast	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
East	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
East SouthEast	11.2%	1.1%	0.0%	0.0%	0.0%	0.0%	12.3%
SouthEast	5.3%	4.0%	0.1%	0.0%	0.0%	0.0%	9.4%
South SouthEast	4.0%	0.1%	0.0%	0.0%	0.0%	0.0%	4.1%
South	3.6%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%
South SouthWest	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%
SouthWest	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
West SouthWest	11.8%	0.2%	0.0%	0.0%	0.0%	0.0%	12.0%
West	13.8%	2.7%	0.0%	0.0%	0.0%	0.0%	16.5%
West NorthWest	1.9%	1.5%	0.1%	0.0%	0.0%	0.0%	3.5%
NorthWest	1.9%	1.0%	0.0%	0.0%	0.0%	0.0%	2.9%
North NorthWest	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%
North	4.1%	1.4%	0.0%	0.0%	0.0%	0.0%	5.5%
Total	64.9%	12.2%	0.2%	0.0%	0.0%	0.0%	77.3%

Percent Calm (<0.3 m/s)	22.7%
Number of Valid Hourly-Average Data	806
Total Workable Hours in Time Period	806



APPENDIX G. WYAMZ EXCEEDANCE SUMMARY

Table G-1 Meadow Lake Station: Summary of exceedances for January 1 to November 16, 2019

Exceedance Information			Summary of Other Parameters During Exceedance						
Pollutant	Conc.	Exceedance Date mmm-dd	WS m/s	WD deg	Rain mm	ET C	SO ₂ ppb	H ₂ S ppb	PM _{2.5} µg/m ³
No recorded exceedances									

Table G-2 Maidstone Station: Summary of 1-hour exceedances for 2019

1-hour Exceedance Information			Summary of Other Parameters During Exceedance								
Pollutant	Conc.	Exceedance Time mmm-dd hh:mm	WS m/s	WD deg	AQI -	Rain mm	ET C	SO ₂ ppb	NO ₂ ppb	H ₂ S ppb	PM _{2.5} µg/m ³
H ₂ S	12.5	Jun-13 06:00	0.3	183	8	0.0	11.8	0	10	12.5	9
H ₂ S	11.7	Jul-29 06:00	0.5	137	4	0.0	10.1	0	4	11.6	5
H ₂ S	13.3	Aug-08 05:00	0.4	190	7	0.0	8.6	0	5	13.3	9

* No recorded 24- hour exceedances

Table G-4 Clavet Station: Summary of exceedances for 2019

Exceedance Information			Summary of Other Parameters During Exceedance						
Pollutant	Conc.	Exceedance Date mmm-dd	WS m/s	WD deg	Rain mm	ET C	SO ₂ ppb	H ₂ S ppb	PM _{2.5} µg/m ³
No recorded exceedances									

Table G-5 Kerrobert Station: Summary of exceedances for 2019

Exceedance Information			Summary of Other Parameters During Exceedance						
Pollutant	Conc.	Exceedance Date mmm-dd	WS m/s	WD deg	Rain mm	ET C	SO ₂ ppb	H ₂ S ppb	PM _{2.5} µg/m ³
No recorded exceedances									

Table G-6 Meadow Lake City Station: Summary of exceedances for November 28 to December 31, 2019

Exceedance Information			Summary of Other Parameters During Exceedance						
Pollutant	Conc.	Exceedance Date mmm-dd	WS m/s	WD deg	Rain mm	ET C	SO ₂ ppb	H ₂ S ppb	PM _{2.5} µg/m ³
No recorded exceedances									

Western Yellowhead Air Management Zone Inc.
Financial Statements
December 31, 2019

Western Yellowhead Air Management Zone Inc.

Contents

For the year ended December 31, 2019

	<i>Page</i>
Management's Responsibility	
Independent Auditor's Report	
Financial Statements	
Statement of Financial Position.....	1
Statement of Operations and Changes in Net Assets.....	2
Statement of Cash Flows.....	3
Notes to the Financial Statements.....	4

Management's Responsibility

To the Members of Western Yellowhead Air Management Zone Inc.:


Management is responsible for the preparation and presentation of the accompanying financial statements, including responsibility for significant accounting judgments and estimates in accordance with Canadian accounting standards for not-for-profit organizations and ensuring that all information in the annual report is consistent with the statements. This responsibility includes selecting appropriate accounting principles and methods, and making decisions affecting the measurement of transactions in which objective judgment is required.

In discharging its responsibilities for the integrity and fairness of the financial statements, management designs and maintains the necessary accounting systems and related internal controls to provide reasonable assurance that transactions are authorized, assets are safeguarded and financial records are properly maintained to provide reliable information for the preparation of financial statements.

The Board of Directors is composed entirely of Directors who are neither management nor employees of the Organization. The Board is responsible for overseeing management in the performance of its financial reporting responsibilities, and for approving the financial information included in the annual report. The Board fulfils these responsibilities by reviewing the financial information prepared by management and discussing relevant matters with management and external auditors. The Board is also responsible for recommending the appointment of the Organization's external auditors.

MNP LLP is appointed by the members to audit the financial statements and report directly to them; their report follows. The external auditors have full and free access to, and meet periodically and separately with, both the Board and management to discuss their audit findings.

April 3, 2020


Executive Director

Independent Auditor's Report

To the Members of Western Yellowhead Air Management Zone Inc.:

Opinion

We have audited the financial statements of Western Yellowhead Air Management Zone Inc. (the "Organization"), which comprise the statement of financial position as at December 31, 2019, and the statements of operations and changes in net assets, and cash flows for the year then ended, and notes to the financial statements, including a summary of significant accounting policies.

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of the Organization as at December 31, 2019, and the results of its operations and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

Basis for Opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are independent of the Organization in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Responsibilities of Management and Those Charged with Governance for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Organization's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Organization or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing the Organization's financial reporting process.

Auditor's Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

Independent Auditor's Report *(continued)*

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Organization's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Organization's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Organization to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Saskatoon, Saskatchewan

April 3, 2020

MNP LLP

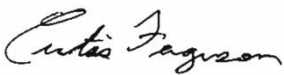
Chartered Professional Accountants

Western Yellowhead Air Management Zone Inc.
Statement of Financial Position


As at December 31, 2019

	2019	2018
Assets		
Current		
Cash resources	152,739	139,589
Short-term investment (Note 3)	103,797	102,364
Prepaid expenses	5,562	3,806
	262,098	245,759
Capital assets (Note 4)	121,533	145,610
	383,631	391,369
Liabilities		
Current		
Accounts payable and accruals	12,358	14,405
Goods and Services Tax payable	1,621	1,474
	13,979	15,879
Subsequent event		
Net Assets		
Unrestricted net assets	369,652	375,490
	383,631	391,369

Approved on behalf of the Board of Directors



Director



Director

The accompanying notes are an integral part of these financial statements

Western Yellowhead Air Management Zone Inc.
Statement of Operations and Changes in Net Assets

For the year ended December 31, 2019

	2019	2018
Revenue		
Membership fees	149,701	153,371
Amortization of deferred contributions <i>(Note 5)</i>	-	20,000
Investments	2,248	1,856
	151,949	175,227
Expenses		
Amortization	30,677	37,875
Insurance	5,910	7,011
Management fees <i>(Note 6)</i>	42,060	45,840
Meetings	1,130	751
Monitoring	53,706	59,415
Office supplies	295	476
Professional fees	6,338	6,175
Promotion	353	3,010
Repairs and maintenance	15,511	13,064
Telephone	1,807	1,800
Travel	-	526
	157,787	175,943
Deficiency of revenue over expenses	(5,838)	(716)
Net assets, beginning of year	375,490	376,206
Net assets, end of year	369,652	375,490

The accompanying notes are an integral part of these financial statements

Western Yellowhead Air Management Zone Inc.

Statement of Cash Flows

For the year ended December 31, 2019

	2019	2018
Cash provided by (used for) the following activities		
Operating		
Deficiency of revenue over expenses	(5,838)	(716)
Amortization	30,677	37,875
Amortization of deferred contributions	-	(20,000)
	24,839	17,159
Changes in working capital accounts		
Prepaid expenses	(1,756)	-
Accounts payable and accruals	(2,047)	(3,449)
Goods and Services Tax payable	147	(270)
	21,183	13,440
Investing		
Purchase of short-term investment	(103,797)	(102,364)
Proceeds on disposal of short-term investment	102,364	101,150
Purchase of capital assets	(6,600)	(6,117)
	(8,033)	(7,331)
Increase in cash resources	13,150	6,109
Cash resources, beginning of year	139,589	133,480
Cash resources, end of year	152,739	139,589

The accompanying notes are an integral part of these financial statements

Western Yellowhead Air Management Zone Inc.

Notes to the Financial Statements

For the year ended December 31, 2019

1. Incorporation and nature of the organization

Western Yellowhead Air Management Zone Inc. (the "Organization") was incorporated under The Non-Profit Corporations Act of Saskatchewan on February 14, 2012.

The Organization collects and monitors ambient air quality data in Northwest Saskatchewan and makes the data available to all members.

2. Significant accounting policies

The financial statements have been prepared in accordance with Canadian accounting standards for not-for-profit organizations using the following significant accounting policies:

Revenue recognition

The Organization follows the deferral method of accounting for contributions. Restricted contributions are recognized as revenue in the year in which the related expenses are incurred. Unrestricted contributions are recognized as revenue when received. Membership fees are recognized when received.

Financial instruments

The Organization recognizes its financial instruments when the Organization becomes party to the contractual provisions of the financial instrument. All financial instruments are initially recorded at their fair value, including financial assets and liabilities originated and issued in related party transactions with management.

At initial recognition, the Organization may irrevocably elect to subsequently measure any financial instrument at fair value. The Organization has not made such an election during the year. All financial assets and liabilities are subsequently measured at cost or amortized cost.

Transaction costs and financing fees are added to the carrying amount for those financial instruments subsequently measured at amortized cost or cost.

Financial asset impairment

The Organization assesses impairment of all of its financial assets measured at cost or amortized cost. The Organization groups assets for impairment testing when available information is not sufficient to permit identification of each individually impaired financial asset in the group. Management considers whether there has been a breach in contract, such as a default or delinquency in interest or principal payments in determining whether objective evidence of impairment exists. When there is an indication of impairment, the Organization determines whether it has resulted in a significant adverse change in the expected timing or amount of future cash flows during the year. If so, the Organization reduces the carrying amount of any impaired financial assets to the highest of: the present value of cash flows expected to be generated by holding the assets; the amount that could be realized by selling the assets; and the amount expected to be realized by exercising any rights to collateral held against those assets. Any impairment, which is not considered temporary, is included in current year excess of revenues over expenses.

The Organization reverses impairment losses on financial assets when there is a decrease in impairment and the decrease can be objectively related to an event occurring after the impairment loss was recognized. The amount of the reversal is recognized in the excess of revenues over expenses in the year the reversal occurs.

Capital assets

Purchased capital assets are recorded at cost. Contributed capital assets are recorded at fair value at the date of contribution if fair value can be reasonably determined.

Amortization is provided using the declining balance method at rates intended to amortize the cost of assets over their estimated useful lives.

	Rate
Website	50 %
Equipment	20 %

Western Yellowhead Air Management Zone Inc.
Notes to the Financial Statements
For the year ended December 31, 2019

2. Significant accounting policies *(Continued from previous page)*

Long-lived assets

Long-lived assets consist of capital assets. Long-lived assets held for use are measured and amortized as described in the applicable accounting policies.

When the Organization determines that a long-lived asset no longer has any long-term service potential to the Organization, the excess of its net carrying amount over any residual value is recognized as an expense in the statement of operations. Write-downs are not reversed.

Deferred contributions related to capital assets

Deferred contributions related to capital assets represent the unamortized portion of contributed capital assets and restricted contributions that were used to purchase the Organization's equipment. Recognition of these amounts as revenue is deferred to periods when the related capital assets are amortized.

Measurement uncertainty

The preparation of financial statements in conformity with Canadian accounting standards for not-for-profit organizations requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses during the reporting period.

Amortization is based on the estimated useful lives of capital assets.

These estimates and assumptions are reviewed periodically and, as adjustments become necessary they are reported in excess of revenues and expenses in the periods in which they become known.

3. Short-term investment

Balance consists of a \$103,797 (2018 - \$102,364) Guaranteed Investment Certificate with an interest rate of 2.10% (2018 - 1.40%) maturing on December 20, 2020 (2018 - December 20, 2019).

4. Capital assets

	<i>Cost</i>	<i>Accumulated amortization</i>	<i>2019 Net book value</i>	<i>2018 Net book value</i>
Website	7,956	6,464	1,492	2,984
Equipment	454,035	333,994	120,041	142,626
	461,991	340,458	121,533	145,610

Western Yellowhead Air Management Zone Inc.
Notes to the Financial Statements
For the year ended December 31, 2019

5. Deferred contributions

Deferred contributions consist of externally restricted grants for the reimbursement of the purchase of four airpointers. Recognition of these amounts as revenue is amortized over the useful life of the related assets. Changes in the deferred contribution balance are as follows:

	2019	2018
Balance, beginning of year	-	20,000
Less: Amount recognized as revenue	-	(20,000)
<hr/>		
Less: current portion	-	-
<hr/>		
Balance, end of year	-	-
<hr/>		

6. Related party transactions

The Organization has entered into a contract agreement for management services, expiring December 2021. The contract is based on hours required, to a maximum of \$50,000. Any overage is required to be approved by the Board of Directors. Included in expenses for the current year are \$42,060 (2018 - \$45,840) of management fees. The expenses were incurred in the normal course of operations and measured at the exchange amount, which is the amount of consideration established and agreed to by the related parties.

7. Financial instruments

The Organization, as part of its operations, carries a number of financial instruments. It is management's opinion that the Organization is not exposed to significant interest, currency, credit, liquidity or other price risks arising from these financial instruments except as otherwise disclosed.

8. Commitment

The Organization has entered into a contract for the operation and maintenance of airpointer monitoring stations, expiring June 30, 2021, with minimum annual payments as follows:

2020	42,000
2021	21,000

9. Subsequent event

Subsequent to year-end, there was a global outbreak of COVID-19 (coronavirus), which has had a significant impact on businesses through the restrictions put in place by the Canadian, provincial and municipal governments regarding travel, business operations and isolation/quarantine orders. At this time, it is unknown the extent of the impact the COVID-19 outbreak may have on the Organization as this will depend on future developments that are highly uncertain and that cannot be predicted with confidence. These uncertainties arise from the inability to predict the ultimate geographic spread of the disease, and the duration of the outbreak, including the duration of travel restrictions, business closures or disruptions, and quarantine/isolation measures that are currently, or may be put, in place by Canada and other countries to fight the virus.

APPENDIX I. WYAMZ BOARD OF DIRECTORS

Curtis Ferguson Board Chair (Nutrien Allan)



Curtis Ferguson, grew up in rural Saskatchewan and moved to Saskatoon and attended the University of Saskatchewan, attaining a BSc in Agriculture and Bioresource Engineering. In pursuit of a career in the environmental sector, Curtis relocated to Alberta and spent the next seven years in the oil in gas industry, providing environmental consulting support and also focusing on a water management strategy for Hydraulic Fracturing. Since relocating back to Saskatoon, Curtis has been employed with the Ministry of Environment, Mosaic Colonsay, and Nutrien Allan Potash Operations. His current role is Lead Environmental Engineer at Nutrien Allan which duties include the responsibility to maintain the facility license to operate and undertake environmental improvements related to water, air, energy, and waste management.

David Henry Vice Chair (Saskatchewan Environmental Society)



David Henry has been an active member of the Saskatchewan Environmental Society since 2008. In 2007, he retired from his position as conservation ecologist for Parks Canada in the Yukon Territory. In that work, he developed an ecological monitoring program for each national park in the Yukon. He is presently an Adjunct Professor, Faculty of Environmental Design, University of Calgary. In the past working with others, he coordinated the public campaigns that were instrumental in the establishment Grasslands National Park and the revision of Canada's National Parks Act.

Phil Burry Secretary Treasurer (Husky Energy Upstream)



Mr. Burry is the Team Lead, Upstream Environmental Operations for Husky Energy, based in Lloydminster, Saskatchewan. Phil is a Professional Agrologist with approximately 15 years environmental management experience. He provides technical/regulatory support regarding air, water, waste, biophysical, spill and site remediation projects. Actively engaging key stakeholders is another key responsibility of his current position with Husky. He is very interested in furthering his understanding of regional air quality issues.

Brad Sigurdson Member (Saskatchewan Mining Association)



Mr. Sigurdson is the Vice President – Environment, Safety and Regulatory Affairs Saskatchewan Mining Association (SMA) and he brings nearly 25 years of mining, industrial and government experience to this role; including working in both Canadian and U.S. mining operations as well as previously with the Ministry of Environment as Manager of the Potash and Central Operations Section. During his time with the Ministry of Environment he acted as the advisor to the Industrial Content Committee during the development of the Saskatchewan Environmental Code. Mr. Sigurdson has indicated that “It is a privilege to be a member of the WYAMZ Board and I really enjoy working with a group of individuals that are committed to working in a collaborative and cooperative manner with a

common goal of ensuring excellent air quality in our Air Management Zone”.

Gary Ericson

Member (Saskatchewan Ministry of the Economy)



Mr. Ericson is the Regional Manager of the Lloydminster Office of The Ministry of Economy and holds an ASCT. Designation with the Saskatchewan Applied Science Technologists and Technicians. He graduated from Kelsey Institute of Applied Arts and Sciences in Saskatoon with a Diploma in Mechanical Engineering Technology in 1979. He has over 34 years of oil and gas development experience and considered to be one of our Ministry’s foremost heavy oil well development and production expert. Mr. Ericson has extensive experience in the upstream Petroleum and Natural Gas Industry relating to drilling, servicing, and production issues gained through his years as a field technician and a manager.

Shelley Kirychuk

Member (University of Saskatchewan)



Dr. Shelley Kirychuk is a nurse and holds Masters and PhD Degrees in Preventative Medicine and occupational hygiene. She is an Associate Professor at the University of Saskatchewan’s Department of Medicine in the division of the Canadian Centre for Health and Safety in Agriculture. Her research and extension activities focus on environmental epidemiology and more specifically respiratory exposures and respiratory health of occupational, rural and agricultural populations.

Darren Letkeman

Member (Environmental Protection Branch – Ministry of Environment)



Mr. Letkeman is an Environmental Protection Officer with the Industrial Branch of the Ministry of Environment and has been with the ministry since 1998. He has extensive regulatory experience in Northwestern Saskatchewan, and has worked with municipal, commercial, and industrial operations. Prior to working for the ministry, Darren worked 6 years as an Environmental Co-ordinator for an industrial wood processing facility.

Aaron Studer

Member (Husky Energy Downstream)



Aaron Studer joined Husky in 2004 and is currently leading a team of 5 environmental specialists tasked with maintaining environmental compliance at Husky's Downstream Assets in the Lloydminster area. He has worked extensively in the environmental field for 6 years and was previously working for an international environmental consulting firm. His areas of experience include project and office management; all aspects of groundwater well installation, monitoring, sampling, and reporting; Phase I and II assessments; contaminated site remediation; and licensing, construction and commissioning of new facilities. He has technical experience in reclamation assessments, lease construction, drilling, service, and operations.

Lovyl Zweifel Member

Jocelan Lundquist Member (Husky Energy Downstream)



Dr. Simon Kapaj Member (Saskatchewan Health Authority)



Dr. Simon Kapaj has worked as a Medical Health Officer in Saskatoon since 2014. He obtained his degree in medicine at the University of Tirana in Albania in 1993 and practiced family medicine before coming to Canada. He completed his Masters of Public Health and the residency training in Public Health and Preventive Medicine at the University of Saskatchewan. His interests and contributions to improving the health of residents of Saskatchewan include work across broad spectrum of public health services. He has been active in Immunizations, Occupation Health and Safety, Environmental Health, Prevention and Protection including infectious diseases and outbreaks, Disaster and Emergency Planning, and fostering partnerships with community groups. He serves as Medical Director for Environmental Public Health/Health Protection for the Saskatchewan Health Authority.

Dr. Kapaj is a Fellow in Public Health and Preventive Medicine of the Royal College of Physicians of Canada and a Diplomate of American Board of Preventive Medicine. He also is an Assistant Professor at the University of Saskatchewan, where he continues to supervise medical students and residents in Public Health and Preventive Medicine.

Terry Gibson Executive Director



Mr. Gibson brings more than 30 years of Public Health/Environmental Health experience to the position. He has held the positions of President of the Saskatchewan Public Health Association and Vice-Chair of the Saskatchewan Epidemiology Association. He teaches Public Health Protection at the University of Saskatchewan Master of Public Health Program and has served on many provincial and national boards and committees. Terry is committed to working with industry and regulators in a consensus decision making process to ensure that the health of the environment of south east Saskatchewan is always protected.

APPENDIX J.

WYAMZ HISTORICAL MEMBER COMPANIES

The Western Yellowhead Air Management Zone would like to express our gratitude to our members over the years for their support of WYAMZ, for their very strong support regarding quality air data collection, and for their commitment to the citizens and environment of Saskatchewan.

- 5 Star Resources
 - Agrium Inc.
 - Akzo Nobel
 - Alta Gas
 - Bayhurst Gas
 - Baytex Energy Ltd.
 - Beaumont Energy
 - Black Pearl Resources
 - Bruin Oil and Gas
 - Buzzard Resources
 - Caltex Resources
 - Canadian Natural Resources Limited
 - Can-Expo
 - Carrier Forest
 - Cenovus Energy
 - City of Saskatoon
 - Compass Minerals
 - Conoco Phillips
 - Cory Atco Operations
 - Crescent Point
 - Crocotta Energy
 - Crocus Oil
 - Devon Canada Corporation
 - Enerplus Corporation
 - ERCO Worldwide
 - Gear Energy
 - Halo Exploration
 - Husky Oil Operations Limited
 - Hyzer Energy
 - Ish Energy
 - Kaisen Energy
 - Leeco Resources
 - Longhorn Oil and Gas
 - Longview Oil
 - Modexco Petroleum
 - Meridian Cogeneration Power
 - Mosaic
 - NAL Resources Limited
 - Niven Fisher
 - North Battleford Power L.P.
 - North West Bio Energy
 - Northern Blizzard
 - Novus Energy Inc.
 - P&H Milling
 - Palliser Oil and Gas
 - Pengrowth Energy Corporation
 - Plasti-Fab
 - Potash Corp
 - Prosper Energy
 - Raven Resources
 - Renegade Petroleum
- Repsol Canada
 - Rife Resources
 - Saputo Products
 - SaskEnergy Incorporated/TransGas Limited
 - Sask Power
 - Secure Energy
 - Smitty's Farms
 - Sojourn Energy
 - Spartan Energy
 - Sphere Energy
 - Spur Resources
 - SSSS Oil Partnership
 - Tamarack Valley
 - Talisman Energy
 - Tuscany Energy
 - Twin Butte Energy
 - Viterra
 - Zelmar Energy

CONTRIBUTING MEMBERS THIS YEAR

For information on how to become a member, please contact Terry Gibson, Executive Director at (306) 491-9198.

- Agrium Inc.
- Akzo Nobel
 - Atco Cory
- Bayhurst Sask Engery
 - Baytex
- Black Pearl Resources
 - Canadian Natural Resources Limited
 - Can-Expo Energy
 - Cargill
 - City of Saskatoon
 - Compass Minerals
 - Crescent Point Resources Partnership
 - ERCO Worldwide
 - Freehold Royalties
- Husky Group of Companies
 - Husky Meridian Cogeneration
 - Kaisen Energy
 - Leeco Resources Ltd.
 - Lehmkuhl Farms Ltd.
 - Longhorn Oil and Gas
 - Mosaic Potash
 - NAL Resources Management Ltd
 - North Battleford Power L.P.
 - North West Bio Energy
 - P&H Milling Group
 - Pele Energy
- Petro One Energy Group
 - Prosper Petroleum
 - Repsol Canada Energy Partnership
 - Serafina Energy Ltd.
 - Smitty's Farms
 - Spartan Energy Group
 - Surge Energy
 - Trasn Gas Sask Energy
 - Viterra Inc.
 - WestLake Energy
 - Zelmar Energy Ltd.

End of the Report